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The Individual May Fail in His Duties, May Be Unmindful of the Ethics of Business and the Profession and Because of That, Do Harm; but If He Is Observant, He Adds a Service for Pharmacy; Its Significance Grows in Public Health Service.

Vol. XXVII, No. 3 MARCH, 1938

JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION

TRADE MARK

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THE 86th ANNUAL MEETING OF THE AMERICAN PHARMACEUTICAL ASSOCIATION WILL BE HELD IN MINNEAPOLIS, MINN., Hotel Nicollet, August 22–27, 1938.

The 1938 Meetings of the American Association of Colleges of Pharmacy, the National Association of Boards of Pharmacy, Conference of Pharmaceutical Association Secretaries, of the Pharmaceutical Law Enforcement Officials and the Plant Science Seminar will also be held in Minneapolis, Minn.

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Holadin has long proved a definite resource in pancreatic disorders, diseases associated therewith. Holadin is put up in powder in 1 oz. and ½ oz. vials, no "directions;" as commonly prescribed, the pharmacist may readily attach the usual prescription label.

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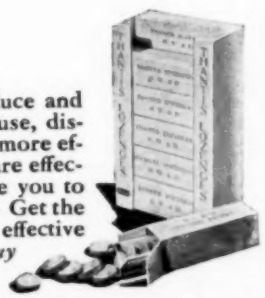

relieve soreness and irritation of common throat affections, reduce and often prevent infection. • Thantis Lozenges are convenient in use, dissolve slowly, permit prolonged treatment of irritated areas, are more effective than gargles. • Physicians prescribe them because they are effective. • Recent price reductions provide greater profits—enable you to supply a scientific medically accepted product at moderate cost. • Get the good will and repeat business of customers by supplying an effective product. • *Thantis Lozenges, H. W. & D., are supplied in Display Boxes containing 12 cartons of 12 lozenges each.*

HYNSON, WESTCOTT & DUNNING, INC.
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THE FLÜCKIGER MEDAL.

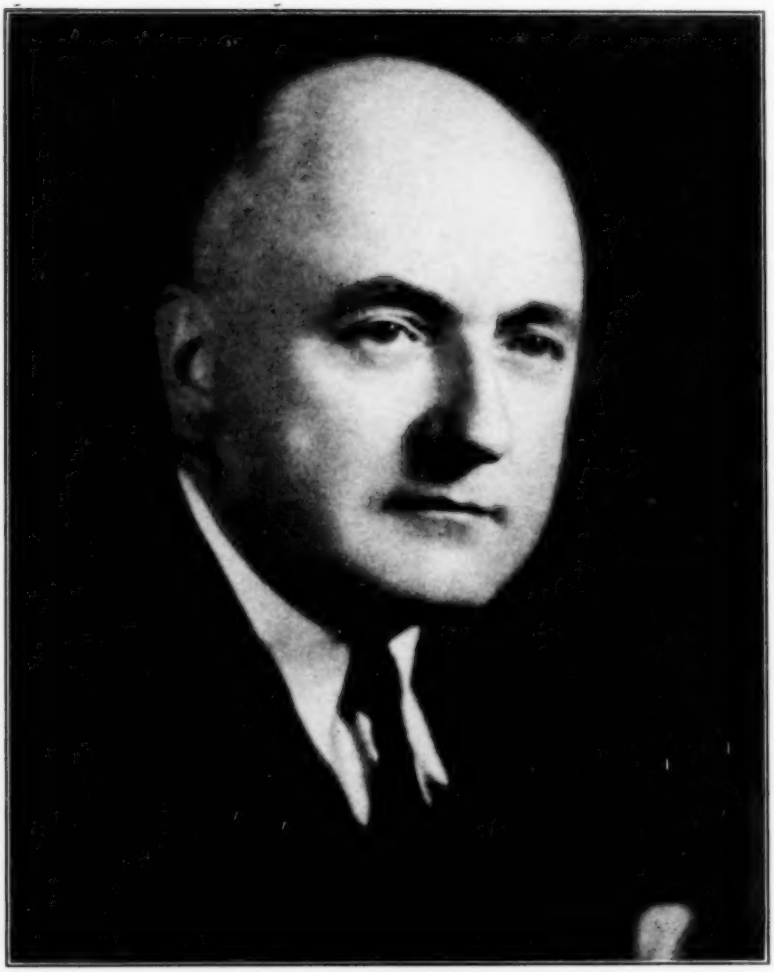
F. A. Flückiger

We have been advised that Dr. Henry Rusby has been named Flückiger medalist for 1938. When the award is made, other honors will be bestowed upon him and a brief sketch of his activities will appear in the JOURNAL; at this time references to the medal will be given.

A number of the letters of the Flückeriana were published in the *New York Apotheker Zeitung* and others in the JOURNAL A. PH. A. These valuable contributions by Dr. Edward Kremers give much information relative to this outstanding pharmacist who lives in his work.

Upon his retirement, Professor Flückiger was the recipient of many honors; a committee was formed for instituting a Flückiger Memorial Fund, constituted of Professors: Tschirch of Bern; Schaer of Strassburg; Hilger of Munich; Weber of Zurich; and Flückiger. Following the death of the latter, his place was filled by election by the National Association of Pharmacists of Germany. One of the objects of the fund was the provision of a Flückiger Medal to be presented on special occasions to distinguished investigators.

At the meeting of the Flückiger Committee at Constance (1895) it was decided, says the *Apotheker Zeitung* (Germany) that in the future only gold medals should be struck and they only should be awarded every five years from 1897 onward. The award will be made by the Committee, and the medal will be delivered to the recipient by the German or Swiss Apotheker Verein, alternately, at their annual meetings. American pharmacists, as far as our records show, are: Fr. Hoffman (for a time of New York City); J. B. Nagelvoort, of Detroit; Frederick Power, of Washington; and now H. H. Rusby, New York City.



HUGH C. MULDOON.

JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION

VOL. XXVII MARCH, 1938 No. 3

HUGH CORNELIUS MULDOON.

Hugh C. Muldoon, D.Sc., 38th president of the American Association of Colleges of Pharmacy, is professor of chemistry and dean of the school of pharmacy of Duquesne University, Pittsburgh, a school which he organized and has directed since its founding in 1925. He is an experienced pharmacist, chemist, teacher and executive. He holds degrees from the Albany College of Pharmacy, of Union University and from Valparaiso University, and has done special work in scientific and professional fields at the Massachusetts College of Pharmacy, Boston University and Harvard. In addition to writing for the professional and trade journals he has published three textbooks: a pharmaceutical Latin, an organic chemistry and a laboratory manual of organic chemistry. He is editor of the *Science Counselor*, a nationally circulated journal of scientific information and teaching methods for teachers of science in Catholic high schools.

Immediately after his graduation from the Albany College of Pharmacy in 1912, Dean Muldoon joined the staff of the Massachusetts College of Pharmacy in Boston as instructor in chemistry and Latin, and assistant to Dean Theodore J. Bradley. In 1918, he became professor of chemistry at the Albany College of Pharmacy. In 1920, he was appointed dean of the school of pharmacy and head of the department of chemistry at Valparaiso University. Coming to Pittsburgh in 1925, he established the school which he now heads.

Dean Muldoon is a member of the Phi Delta Chi and Phi Delta Psi fraternities, and of several scientific and professional organizations including the AMERICAN PHARMACEUTICAL ASSOCIATION, the American Chemical Society, the American Association for the Advancement of Science, the Pennsylvania Academy of Science and the American Science Teachers Association. He is a member of the U. S. P. XI Revision Committee, and for eleven years has served as secretary of District No. 2, Conference of Boards and Colleges. He is a member of the Syllabus Committee and other A. PH. A. and A. A. C. P. committees. He was one of the workers engaged in the Commonwealth Study of Pharmacy.

Dean Muldoon is a bachelor, a musician of sorts and an enthusiastic gardener. He has recently rebuilt his summer home on his farm at Dushore, in the mountains of Pennsylvania.

EDITORIAL

E. G. EBERLE, EDITOR 2215 Constitution Ave., WASHINGTON, D. C.

ECONOMY IN MEDICATION.

UNDER the heading above, Dr. Bernard Fantus discusses the subject as an important question in all hospitals and particularly in large institutions as Cook County Hospital, where the saving resulting from coöperation between prescribing physicians and dispensing pharmacists runs into a huge sum. It will be understood that the saving is not to be brought about by inferiority in material or production but by determining that which has been found best by test.

In the article prepared by the *Journal A. M. A.* the discussion was largely devoted to hypnotics. Reference is made to "Grabfield's Observations on Efficiency of Commonly Used Hypnotics." A number of references are taken from E. N. Gathercoal's "Prescription Ingredient Survey." Questions such as these are given as valuable subjects for discussion with physicians who have hospital connection and for information in their practice.

FOOD AND DRUG BILL HAS BEEN DELAYED.

WHILE other reasons obtain for delay in passing the Food and Drug Bill it is probable that the unfortunate deaths resulted from uncontrolled products. The preparations have shown conditions which need correction. It seems that in one case, perhaps more, a product was allowed to stand for several days before being sterilized. If tetanus organism was present in the product it would have had two days in which to develop the toxin. These possibilities are suggestive and not confirmed, but deaths have resulted from some cause.

It has brought to the minds of legislators the dangers which should be provided against in laws of this kind and may result in unreasonable provisions. The AMERICAN PHARMACEUTICAL ASSOCIATION by resolution regretted delay in such important enactments.

PUBLIC HEALTH SERVICE.

THE PUBLIC and industry have taken an active part in promoting better health conditions. In "Charters Report"—"Basic Curriculum Material," pharmacists find advice relative to duties and while there is some lack of observance, it is gratifying that pharmacists, as a class, accept as a general principle that they should neither diagnose nor prescribe for disease and their professional regard and understanding makes them ready to support efforts to correct the dangers of habits, of practices and misuse of habit-forming drugs.

The late Governor Albert C. Ritchie, of Maryland, emphasized the importance of Pharmacy in Public Health Service and valued it as an essential activity in the Service.

The pharmacist has always been deeply interested in drugs of definite standards and purity; in fact, the establishment of the AMERICAN PHARMACEUTICAL ASSOCIATION resulted, because of the purpose to bring about legislation to that end and Pharmacy has for its primary object the service which it can render to the public in safeguarding the handling, sale, compounding and dispensing of medicinal substances.

CURB OF VENEREAL DISEASES.

DR. THOMAS PARRAN, Surgeon General U. S. Public Health Service, and his co-workers are making progress in the fight against venereal diseases. One point in the progress is to discover infections, steps in treatment and prevention. The helpfulness of pharmacists is of importance and gratifying, because it has contributed to the efforts of those who are waging the war. The duty of the latter is to treat the disease and prevent the spread. Pharmacists have a part in conveying knowledge of the dangers that result from those who have become infected and failed to secure adequate medical treatment, not only to relieve the suffering of the afflicted but the dangers of the affliction to others. The question is a serious one in large establishments and society at large; it brings up questions of employment and unemployment as there may be disease carriers in both classes.

Theodore Rosenthal, M.D., Assistant Director, Bureau of Social Hygiene, in charge of Education and Epidemiology, New York City Department of Health in an address said, in part, "The members of the pharmaceutical profession, in common with the other members of the allied medical professions, have a great interest and responsibility in combating syphilis, not only as citizens and taxpayers, but because of their professional obligations and qualifications."

The history of medical progress shows that the combined efforts for public health have been successful and points out the way for like endeavor.

THE AMERICAN PHARMACEUTICAL ASSOCIATION was represented by Secretary E. F. Kelly at the recent annual meeting of the American Documentation Institute, 2101 Constitution Avenue, Washington, D. C., when it was announced to the nominees of the fifty national learned societies which constitute its membership that the Institute is now operating the non-profit Bibliofilm service in the Library of Congress, the Army Medical Library and the Library of the Department of Agriculture. Scholars and Libraries may have printed or manuscript material copied upon 35-millimeter photographic negative film or in the form of a legible photoprint made by enlargement from the negative at a cost of one cent per page of film or ten cents per page for photoprints, plus a fixed charge on twenty cents per item. It is expected that this service will have an increasingly wide application.

REPORT ON LIVER PRODUCTS BY THE UNITED STATES PHARMACOPŒIA ANTI-ANEMIA PREPARATIONS ADVISORY BOARD.

The standardization of products for the treatment of pernicious anemia is defined for the first time by the Eleventh Revision of the United States Pharmacopœia as follows: "Liver, stomach and other preparations used for this purpose, to be recognized as meeting the specifications of this Pharmacopœia, must be approved by the 'U. S. P. Anti-Anemia Preparations Advisory Board.' Approved products must have complied with the following specifications: 1. There shall have been submitted from time to time, as requested by the Board, satisfactory clinical data from treatment, with the product in question, of cases of Addisonian pernicious anemia. 2. The clinical data submitted shall satisfy the U. S. P. Anti-Anemia Preparations Advisory Board that the administration of the material in question, as prepared from liver or stomach can produce a satisfactory result in the dose given."

In accordance with this requirement, the U. S. P. Anti-Anemia Preparations Advisory Board has considered data submitted by various pharmaceutical companies. In each case the response of the patient to the liver extract in question was studied particularly with respect to the reticulocyte and red blood cell production resulting from the daily administration of a uniform amount of each preparation. The nature of the preparations submitted has been either dry liver extract (Extractum hepatis), liquid extract of liver (Liquor hepatis) or parenteral solution of liver (Liquor hepatis purificatus), as defined in the Pharmacopœia of the United States, Eleventh Revision.

Because of the variation in the efficiency of different processes of manufacture, the therapeutic activity of the final product does not necessarily correspond to the amount of liver from which it is derived. It is therefore necessary to define the therapeutic activity of the final product in other terms. Accordingly, the Board has assigned to each acceptable preparation a value in terms of units. The amount of material constituting a "Unit" is considered to be that amount of material which, when given daily to patients with pernicious anemia, has produced a satisfactory hematopoietic response. Since in the average case material derived from about thirty times as much liver must be given by mouth to produce the same response as when given by injection, it has been necessary to define the "Unit" either as an "oral" unit or as an "injectable" unit, according to the intended method of administration of each preparation.

Accordingly, it is understood that on labels, bottles or cartons, or in advertising circulars, the manufacturer whose products have been assigned unitage by the Board shall no longer state the number of grams of liver employed in making the preparation, but merely either the number of cubic centimeters or grams of material constituting a unit. Depending on the method to be used in the administration of the preparation, the unit will be defined as either an "oral" unit or an "injectable" unit. Definition of the number of units in a preparation for "oral" administration in terms of "injectable" units or vice versa is not permitted. It is further understood that if any dosage is suggested by the manufacturer, the dosage recommended should not be less than one unit a day, whether given daily or at longer

intervals. The wording on the label or in the package literature concerning the unitage will give the following information:

"The daily {oral / intramuscular} administration of ....(no.) {grams / cc.} (capsules, teaspoons, etc.) of material prepared by the method employed in producing the contents of this {bottle / vial / package} has been demonstrated to produce a satisfactory hematopoietic response in pernicious anemia, and constitutes a unit according to the United States Pharmacopœia Anti-Anemia Preparations Advisory Board."

In general it is recommended that, without good evidence that no harm will result, the amount of material administered should probably not be less than one unit a day, whether given daily or in multiple amounts at longer intervals. In many instances it is probable that the clinical indications will render it advisable to give the patient much more than a dosage averaging a unit a day. It must be recognized that the amount of material constituting a unit is determined largely on the basis of the hematopoietic response and does not imply that such an amount is necessarily effective in the control of gastrointestinal or neural manifestations. Furthermore, there is some evidence that the effectiveness of different types of preparations, although similar when defined in terms of units with respect to blood formation, may differ in their effectiveness upon the gastrointestinal or neural manifestations. A full discussion of the indications for the administration of liver preparations is obviously outside the scope of this announcement; and through the coöperation of the American Medical Association and the Committee of Revision of the United States Pharmacopœia, a special article on this subject has been published: "The Use of Drugs in the Treatment of Anemia," *J. A. M. A.*, 107, 1633–1636 (November 14, 1936).

The Board will, as occasion arises, re-evaluate products based on new clinical data or assign unitage to new products submitted by manufacturers and accepted by the Board.

UNITED STATES PHARMACOPŒIA ANTI-ANEMIA
PREPARATIONS ADVISORY BOARD.

February 14, 1938.

The Advisory Board has designated below the unitage of the acceptable liver products of the following manufacturers and distributors.

ABBOTT LABORATORIES, North Chicago, Illinois.

1. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**

   In the following dilutions:

   (*a*) 0.1 cc. equals 1 unit (injectable)
   (*b*) 0.2 cc. equals 1 unit (injectable).

2. **Extractum Hepatis. Dry Liver Extract.**

   Powder in capsules. 50 capsules (25 Gm.) equal 1 unit (oral).

ARMOUR AND COMPANY, Chicago, Illinois.

1. **Liquor Hepatis. Liquid Extract of Liver.**

   45 cc. equals 1 unit (oral).

2. **Extractum Hepatis. Dry Liver Extract.**

   9 capsules (4.5 Gm.) equal 1 unit (oral).

BASIC ENDOCRINES, INC., San Francisco, California.

Extractum Hepatis. Dry Liver Extract.

50 capsules (25 Gm.) equal 1 unit (oral).

GEORGE A. BREON AND COMPANY, INC., Kansas City, Missouri.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

In the following dilutions:

(*a*) 0.1 cc. equals 1 unit (injectable)
(*b*) 0.2 cc. equals 1 unit (injectable)
(*c*) 0.3 cc. equals 1 unit (injectable)
(*d*) 0.4 cc. equals 1 unit (injectable).

BUFFALO PHARMACAL CO., Buffalo, New York.

1. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**

   0.2 cc. equals 1 unit (injectable).

2. **Extractum Hepatis. Dry Liver Extract.**

   50 capsules (25 Gm.) equal 1 unit (oral).

CARROLL DUNHAM SMITH PHARMACAL CO., Orange, New Jersey.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

In the following dilutions:

(*a*) 0.1 cc. equals 1 unit (injectable)
(*b*) 0.2 cc. equals 1 unit (injectable).

CHAPPEL LABORATORIES, Rockford, Illinois.

1. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**

   2.5 cc. equals 1 unit (injectable).

2. **Liquor Hepatis. Liquid Extract of Liver.**

   60 cc. equals 1 unit (oral).

CHEMICAL WORKS OF GEDEON RICHTER, INC., Budapest, Hungary.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

2 cc. equals 1 unit (injectable).

CHEPLIN BIOLOGICAL LABORATORIES, Syracuse, New York.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

In the following dilutions:

(*a*) 0.1 cc. equals 1 unit (injectable)
(*b*) 0.4 cc. equals 1 unit (injectable).

THE COLUMBUS PHARMACAL CO., Columbus, Ohio.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

In the following dilutions:

(*a*) 0.1 cc. equals 1 unit (injectable)
(*b*) 0.2 cc. equals 1 unit (injectable).

DIRECT SALES COMPANY, INC., Buffalo, New York.

Extractum Hepatis. Dry Liver Extract.

(*a*) 5 vials (25 Gm.) equal 1 unit (oral)
(*b*) 50 capsules (25 Gm.) equal 1 unit (oral).

THE DRUG PRODUCTS CO., INC., Long Island, New York.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

0.1 cc. equals 1 unit (injectable).

ETHKO CHEMICAL PRODUCTS CO., New York.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

0.4 cc. equals 1 unit (injectable).

FLINT EATON AND COMPANY, Decatur, Illinois.

1. **Extractum Hepatis. Dry Liver Extract.**

   50 capsules (25 Gm.) equal 1 unit (oral).

2. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**

   In the following dilutions:

   (*a*) 0.1 cc. equals 1 unit (injectable)
   (*b*) 0.2 cc. equals 1 unit (injectable).

C. E. JAMIESON AND COMPANY, Detroit, Michigan.

Extractum Hepatis. Dry Liver Extract.

50 capsules (25 Gm.) equal 1 unit (oral).

JENSEN-SALSBERY LABORATORIES, INC., Kansas City, Missouri.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

0.4 cc. equals 1 unit (injectable).

KREMERS-URBAN COMPANY, Milwaukee, Wisconsin.

Extractum Hepatis. Dry Liver Extract.

50 capsules (25 Gm.) equal 1 unit (oral).

THE LAKESIDE LABORATORIES, Milwaukee, Wisconsin

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

In the following dilutions:

(*a*) 0.1 cc. equals 1 unit (injectable)
(*b*) 0.2 cc. equals 1 unit (injectable).

LEDERLE LABORATORIES, Pearl River, New York.

1. **Liquor Hepatis. Liquid Extract of Liver.**

60 cc. equals 1 unit (oral).

2. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**

(*a*) 0.066 cc. equals 1 unit (injectable)
(*b*) 0.3 cc. equals 1 unit (injectable).

ELI LILLY AND COMPANY, Indianapolis, Indiana.

Extractum Hepatis. Dry Liver Extract.

3 vials (12.75 Gm.) equal 1 unit (oral).

THE MALTBIE CHEMICAL CO., Newark, New Jersey.

Extractum Hepatis. Dry Liver Extract.

50 capsules (25 Gm.) equal 1 unit (oral).

THE S. E. MASSENGILL CO., Bristol, Tennessee.

1. **Extractum Hepatis. Dry Liver Extract.**

50 capsules (25 Gm.) equal 1 unit (oral).

2. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**

In the following dilutions:

(*a*) 0.1 cc. equals 1 unit (injectable)
(*b*) 0.2 cc. equals 1 unit (injectable)
(*c*) 0.4 cc. equals 1 unit (injectable).

MCNEIL LABORATORIES, INC., Philadelphia, Pennsylvania.

1. **Extractum Hepatis. Dry Liver Extract.**

50 capsules (25 Gm.) equal 1 unit (oral).

2. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**

0.2 cc. equals 1 unit (injectable).

THE WILLIAM S. MERRELL COMPANY, Cincinnati, Ohio.

Extractum Hepatis. Dry Liver Extract.

50 capsules (25 Gm.) equal 1 unit (oral).

METROPOLITAN LABORATORIES, New York City, New York.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

In the following dilutions:

(*a*) 0.1 cc. equals 1 unit (injectable)
(*b*) 0.4 cc. equals 1 unit (injectable).

MONTGOMERY WARD AND CO., Chicago, Illinois.

Extractum Hepatis. Dry Liver Extract.

75 capsules (25 Gm.) equal 1 unit (oral).

THE NATIONAL DRUG COMPANY, Philadelphia, Pa.

1. **Extractum Hepatis. Dry Liver Extract.**

   50 capsules (25 Gm.) equal 1 unit (oral).

2. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**

   In the following dilutions:

   (*a*) 0.1 cc. equals 1 unit (injectable)
   (*b*) 0.2 cc. equals 1 unit (injectable)
   (*c*) 1.0 cc. equals 1 unit (injectable).

PARKE, DAVIS AND COMPANY, Detroit, Michigan.

1. **Extractum Hepatis. Dry Liver Extract.**

   6 vials (24 Gm.) equal 1 unit (oral).

2. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**

   2.0 cc. equals 1 unit (injectable).

PITMAN-MOORE COMPANY, Indianapolis, Indiana.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

In the following dilutions:

(*a*) 0.1 cc. equals 1 unit (injectable)
(*b*) 0.2 cc. equals 1 unit (injectable).

PREMO PHARMACEUTICAL LABORATORIES, INC., New York, N. Y.

Extractum Hepatis. Dry Liver Extract.

(*a*) 50 capsules (25 Gm.) equal 1 unit (oral)
(*b*) 5 vials (25 Gm.) equal 1 unit (oral).

RAYMER PHARMACAL CO., Philadelphia, Pa.

Liquor Hepatis Purificatus. Parenteral Solution of Liver

0.1 cc. equals 1 unit (injectable).

WILLIAM H. RORER, INC., Philadelphia, Pa.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

0.2 cc. equals 1 unit (injectable).

LEONARD A. SELTZER COMPANY, Detroit, Michigan.

1. **Extractum Hepatis. Dry Liver Extract.**

   50 capsules (25 Gm.) equal 1 unit (oral).

2. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**

   0.1 cc. equals 1 unit (injectable).

SHARP AND DOHME, INC., Philadelphia, Pennsylvania.

Extractum Hepatis. Dry Liver Extract.

(*a*) 50 capsules (25 Gm.) equal 1 unit (oral)
(*b*) 5 vials (25 Gm.) equal 1 unit (oral).

G. H. SHERMAN, M.D., INC., Detroit, Michigan.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.
0.2 cc. equals 1 unit (injectable).

THE SMITH-DORSEY COMPANY, Lincoln, Nebraska.

1. **Extractum Hepatis. Dry Liver Extract.**
50 capsules (25 Gm.) equal 1 unit (oral).

2. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**
In the following dilutions:
(*a*) 0.1 cc. equals 1 unit (injectable)
(*b*) 0.2 cc. equals 1 unit (injectable).

UNITED DRUG CO., Boston, Massachusetts.

Extractum Hepatis. Dry Liver Extract.
50 capsules (25 Gm.) equal 1 unit (oral).

U. S. STANDARD PRODUCTS COMPANY, Woodworth, Wisconsin.

1. **Extractum Hepatis. Dry Liver Extract.**
50 capsules (25 Gm.) equal 1 unit (oral).

2. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**
In the following dilutions:
(*a*) 0.1 cc. equals 1 unit (injectable)
(*b*) 0.2 cc. equals 1 unit (injectable).

THE UPJOHN COMPANY, Kalamazoo, Michigan.

1. **Extractum Hepatis. Dry Liver Extract.**
50 capsules (25 Gm.) equal 1 unit (oral).

2. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**
In the following dilutions:
(*a*) 0.1 cc. equals 1 unit (injectable)
(*b*) 0.2 cc. equals 1 unit (injectable).

VALENTINE MEAT JUICE COMPANY, Richmond, Virginia.

1. **Liquor Hepatis. Liquid Extract of Liver.**
45 cc. equals 1 unit (oral).

2. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**
In the following dilutions:
(*a*) 1.0 cc. equals 1 unit (injectable)
(*b*) 1.5 cc. equals 1 unit (injectable).

THE WARREN-TWEED PRODUCTS COMPANY, Columbus, Ohio.

Extractum Hepatis. Dry Liver Extract.
50 capsules (25 Gm.) equal 1 unit (oral).

WESTERN RESEARCH LABORATORIES, Denver, Colorado.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.
0.4 cc. equals 1 unit (injectable).

THE WILSON LABORATORIES, Chicago, Illinois.

1. **Extractum Hepatis. Dry Liver Extract.**
   - (*a*) 50 capsules (25 Gm.) equal 1 unit (oral)
   - (*b*) 5 vials (25 Gm.) equal 1 unit (oral).
2. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**
   In the following dilutions:
   - (*a*) 0.1 cc. equals 1 unit (injectable)
   - (*b*) 0.2 cc. equals 1 unit (injectable)
   - (*c*) 0.3 cc. equals 1 unit (injectable)
   - (*d*) 0.4 cc. equals 1 unit (injectable).

WINTHROP CHEMICAL COMPANY, New York, N. Y.

Liquor Hepatis Purificatus. Parenteral Solution of Liver.

1.0 cc. equals 1 unit (injectable).

THE ZEMMER COMPANY, Pittsburgh, Pennsylvania.

1. **Liquor Hepatis. Liquid Extract of Liver.**
   45 cc. equals 1 unit (oral).
2. **Extractum Hepatis. Dry Liver Extract.**
   75 capsules (25 Gm.) equal 1 unit (oral).
3. **Liquor Hepatis Purificatus. Parenteral Solution of Liver.**
   In the following dilutions:
   - (*a*) 0.4 cc. equals 1 unit (injectable)
   - (*b*) 0.1 cc. equals 1 unit (injectable).

The Advisory Board will, as occasion arises, issue supplementary announcements either as a revaluation of the above products based upon new clinical data or to make a report upon new products which are submitted.

U. S. P. ANTI-ANEMIA PREPARATIONS ADVISORY BOARD.

February 14, 1938.

U. S. CIVIL SERVICE EXAMINATIONS FOR SENIOR CHEMIST.

Civil Service Examinations will be held for Senior Chemist in any specialized branch at $3800 to $4600 a year and Associate Chemist at $3200 a year. Application must be on file with the U. S. Civil Service Commission at Washington, D. C., not later than the following dates.

(*a*) May 2, 1938, if received from states other than those named in (*b*).

(*b*) May 5, 1938, if received from the following states: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

The salaries named above are subject to a deduction of $3^1/_2\%$ toward a retirement annuity. The duties are to plan, conduct or assist in conducting investigations or research in the special branch of chemistry in which the appointment is made. The degree of responsibility and importance of the duties vary in accordance with the grade.

THE BASIS OF RATINGS.

Competitors will not be required to report for examination at any place but will be rated on the extent and quality of their education and experience which are relevant to the duties of the position applied for on a scale of 100. The candidates must be citizens of the United States and the applications are for positions in the apportioned service at Washington, D. C. They must show legal voting residence in the state or territory claimed for at least one year next preceding the closing date for receipt of applications.

Announcement of further information regarding the examinations can be had from U. S. Civil Service District Office.

Junior Chemist, $2000 a year; Assistant Chemist, $2600; Form No. 40 can be obtained from any of the U. S. Civil Service Commission Officers.

SCIENTIFIC SECTION

BOARD OF REVIEW OF PAPERS.—*Chairman*, F. E. Bibbins; H. M. Burlage, W. G. Crockett, E. V. Lynn, C. O. Lee, L. W. Rising, L. W. Rowe, Heber W. Youngken, Ralph E. Terry, Carl J. Klemme.

THE U. S. P. XI STANDARD FOR TINCTURE DIGITALIS.*

BY L. W. ROWE AND H. W. PFEIFLE.[1]

The application of the best available form of standardization to preparations of a very important but also variable drug such as digitalis is now recognized as essential by the pharmaceutical and medical professions. It is now about forty years since a physiological method using the frog as the test animal was first proposed. The necessity of having some reference standard for comparison has been almost universally accepted and definite progress was made when the U. S. P. XI Revision Committee decided to adopt the International Digitalis Standard Powder or its equivalent in place of the Ouabain which had been the official digitalis standard in U. S. P. IX and X.

However, it is almost equally desirable in the case of a powerful drug such as digitalis that pronounced changes in the activity of official preparations should not be made for obvious reasons. The decision to make the U. S. P. XI standard for Tincture Digitalis conform to the International Standard seemed logical and it was generally felt by those in close touch with the situation that only about a 20% increase in potency would result, which probably would not be particularly noticed clinically.

The present digitalis reference standard No. 915921 of the U. S. P. XI first became available to us late in February of 1936, and since that time frequent extracts and tests of these extracts have been made. At the very outset particular attention should be called to the fact that the proper correction factor was always applied in preparing different extracts of the standards for test so that a *corrected* tincture was always used. The purpose has been to determine from the averages of a sufficient number of careful comparative tests the following facts which should be of much interest to the pharmacist and to the practicing physician: (1) Just how much more active is the present U. S. P. XI standard for Tr. Digitalis than was the U. S. P. X standard? and, (2) What is the activity relationship between the International Standard for Tr. Digitalis, the Canadian Standard and the U. S. P. XI standard?

In a recent and excellent article on this subject by Edmunds, Moyer and Shaw (1) results of a series of assays were given showing how the correction factor 0.745 was obtained for the present U. S. P. XI standard digitalis powder. Reference will frequently be made to points of similarity and contrast as developed in the two papers. It was also shown in a short paper (2) published in February 1934, that the International Standard for Tr. Digitalis averaged 23% higher in activity by the U. S. P. One-Hour Frog Method than the U. S. P. X standard for Tr. Digitalis in which Ouabain was used as the standard. The Canadian Standard Tincture averaged 28% higher in activity than the U. S. P. X Standard Tincture.

From the very beginning of our work with the present digitalis standard powder of the U. S. P. XI it was quite apparent that it was a highly active preparation. Extracts for test were always made with 75% or 80% ethyl alcohol according to the pharmacopœial method, *i. e.*,

* Scientific Section, A. PH. A., New York meeting, 1937.

[1] Research Laboratories, Parke, Davis and Company, Detroit, Michigan.

contact in a glass-stoppered graduated cylinder with frequent shaking for 24 to 48 hours, at room temperature. The powder was quickly and accurately weighed and the correction factor applied so that the tests were always made on a corrected or exactly U. S. P. XI standard Tr. Digitalis. The frogs used were of the *Rana pipiens* variety weighing from 15 to 35 Gm. and the statistical method of Trevan was employed. Twenty to 30 frogs were used on each preparation. It is gratifying to learn that the U. S. P. statistical curve as determined by Edmunds, *et al.*, upon *Rana pipiens* using the U. S. P. XI standard digitalis powder and the one-hour frog method, is very nearly identical with that prepared by Trevan using *Rana temporaria*, the International Standard digitalis powder and a lethal dose frog method.

In 1934 it was found from an average of five direct comparisons between freshly made tinctures from International Standard digitalis powder and U. S. P. X Standard ouabain that the International Standard was 123% of the U. S. P. X standard for Tr. Digitalis. One additional assay was made on June 15, 1936, with the M. S. D. of the International Standard tincture at 0.0065 cc. per Gm. body weight of frog and that of U. S. P. X standard ouabain at 0.00000060 Gm. per Gm., giving a relationship of 115% in favor of the International Standard. One indirect comparison of the two standards gave a 117% figure. Averaging these in with the other five we get a composite figure of 121%. We had been told by others that the International Standard for digitalis was from 20% to 25% stronger than the U. S. P. X standard and our findings confirm that very nicely. All of the assays reported in this paper were supervised by the senior author (R) and about half of the direct comparisons of the various standards were personally carried out by him.

The U. S. P. XI standard for Tr. Digitalis was to be equal to the International Standard according to a preliminary decision made by the Revision Committee and confirmed on page 136 (3) of the U. S. P. XI as follows: "One U. S. P. Digitalis Unit is identical in potency with the International Digitalis Unit..... One International Digitalis Unit represents the activity of 0.10 Gm. of the International Standard Digitalis Powder." Consequently there was every reason to believe that the U. S. P. XI standard Tr. Digitalis would be found by actual test to be 120% or 125% of the U. S. P. X standard to which we were accustomed. Such was not the case, however, as the direct comparisons in Table I between Ouabain and corrected U. S. P. XI digitalis and the indirect comparisons in Table II, where digitalis preparations were assayed at the same time against both standards, will show.

TABLE I.—DIRECT COMPARISON BETWEEN U. S. P. X OUABAIN AND U. S. P. XI DIGITALIS.

		U. S. P. ONE-HOUR FROG METHOD.						
		U. S. P. XI Digitalis (1 Cc. = 0.0745 Gm.).			Ouabain (U. S. P. X).			Potency (XI of X).
	Date.	Dose per Gm.	Stopped.	Curve No.	Dose per Gm.	Stopped.	Curve No.	
1	3/19/36	0.0070 cc.	80%	4.32	0.00000080 Gm.	80%	4.32	137%
2	3/24/36	0.0040 cc.	67%	4.18	0.00000060 "	67%	4.18	180%
3	4/24/36	0.0035 cc.	67%	4.18	0.00000055 "	67%	4.18	188%
4	5/11/36	0.0045 cc.	60%	4.10	0.00000065 "	60%	4.10	160%
5	5/22/36	0.0050 cc.	50%	4.00	0.00000045 "	70%	4.22	108%
6	6/1/36	0.0050 cc.	50%	4.00	0.00000050 "	30%	3.80	126%
7	6/13/36	0.0040 cc.	53%	4.03	0.00000060 "	40%	3.90	186%
8	7/1/36	0.0035 cc.	53%	4.03	0.00000050 "	67%	4.18	165%
9	7/20/36	0.0045 cc.	40%	3.90	0.00000050 "	53%	4.03	129%
10	8/21/36	0.0055 cc.	53%	4.03	0.00000060 "	47%	3.98	133%
11	9/4/36	0.0055 cc.	47%	3.98	0.00000065 "	60%	4.10	138%
12	10/21/36	0.0060 cc.	60%	4.10	0.00000060 "	60%	4.10	120%
13	11/4/36	0.0050 cc.	60%	4.10	0.00000060 "	68%	4.20	140%
14	11/14/36	0.0050 cc.	60%	4.10	0.00000050 "	40%	3.90	126%
15	12/9/36	0.0050 cc.	40%	3.90	0.00000070 "	80%	4.32	152%
16	12/22/36	0.0055 cc.	67%	4.18	0.00000075 "	33%	3.83	178%
17	1/19/37	0.0055 cc.	43%	3.93	0.00000080 "	47%	3.98	172%
18	2/10/37	0.0060 cc.	73%	4.25	0.00000090 "	50%	4.00	191%

Av. of 18 tests = U. S. P. XI standard for Tr. Digitalis is 151% of U. S. P. X standard.

TABLE II.—INDIRECT COMPARISON BETWEEN U. S. P. X AND XI STANDARDS FOR TR. DIGITALIS.

No.	Product.	Number.	U. S. P. One-Hour Frog Method. M. S. D. (Sample and Standard).	Potency.
1	Digifortis Amps.	883494	0.0045 cc. per Gm. at 0.00000050 Gm.	133% of X Std.
2	" "	"	0.0045 cc. " " " 0.0035 cc.	78% of XI "
3	" "	3106476	0.0055 cc. " " " 0.00000050 Gm.	109% of X "
4	" "	"	0.0055 cc. " " " 0.0040 cc.	74% of XI "
5	Digifortis	3090870	0.0040 cc. " " " 0.00000050 Gm.	150% of X "
6	"	"	0.0040 cc. " " " 0.0040 cc.	100% of XI "
7	Tr. Digitalis	880608	0.0080 cc. " " " 0.00000060 Gm.	90% of X "
8	" "	"	0.0080 cc. " " " 0.0040 cc.	50% of XI "
9	" "	B. C. O.	0.0075 cc. " " " 0.00000060 Gm.	96% of X "
10	" "	"	0.0075 cc. " " " 0.0040 cc.	54% of XI "
11	" "	381509	0.0035 cc. " " " 0.00000060 Gm.	205% of X "
12	" "	"	0.0040 cc. " " " 0.0050 cc.	125% of XI "
13	" "	886032	0.0050 cc. " " " 0.00000075 Gm.	180% of X "
14	" "	"	0.0050 cc. " " " 0.0060 cc.	120% of XI "
15	Powd. Ext. Digitalis	873903	0.00018 Gm. " " " 0.00000055 Gm.	122% of X "
16	" " "	"	0.00018 Gm. " " " 0.0040 cc.	70% of XI "
17	" " "	891217	0.00020 Gm. " " " 0.00000055 Gm.	108% of X "
18	" " "	"	0.00020 Gm. " " " 0.0070 cc.	94% of XI "
19	" " "	891013	0.00025 Gm. " " " 0.00000050 Gm.	83% of X "
20	" " "	"	0.00025 Gm. " " " 0.0055 cc.	72% of XI "
21	" " "	895728	0.00030 Gm. " " " 0.00000090 Gm.	119% of X "
22	" " "	"	0.00030 Gm. " " " 0.0060 cc.	72% of XI "
23	Solid " "	888718	0.00020 Gm. " " " 0.00000055 Gm.	110% of X "
24	" " "	"	0.00018 Gm. " " " 0.0035 cc.	63% of XI "
25	Digitalone	3108679	0.009 cc. " " " 0.0000008 Gm.	103% of X "
26	"	"	0.009 cc. " " " 0.0065 cc.	72% of XI "
27	"	031911	0.008 cc. " " " 0.00000060 Gm.	86% of X "
28	"	"	0.008 cc. " " " 0.0060 cc.	74% of XI "
29	Digifortis	884477	0.0065 cc. " " " 0.00000090 Gm.	166% of X "
30	"	"	0.0040 cc. " " " 0.0050 cc.	119% of XI "
31	Tr. Digitalis	2946033	0.0080 cc. " " " 0.00000080 Gm.	113% of X "
32	" "	"	0.0080 cc. " " " 0.0055 cc.	68% of XI "

Assays 1 and 2 show the U. S. P. XI standard is 170% of U. S. P. X (133% ÷ 78%).

3 and 4 = 147%	5 and 6 = 150%	7 and 8 = 180%	9 and 10 = 177%	11 and 12 = 164%
13 and 14 = 150%	15 and 16 = 174%	17 and 18 = 116%	18 and 20 = 115%	21 and 22 = 165%
23 and 24 = 174%	25 and 26 = 143%	27 and 28 = 116%	29 and 30 = 139%	31 and 32 = 166%

Average of these 16 comparative tests of the same product against the two standards shows the U. S. P. XI standard for Tr. Digitalis to be 153% of the U. S. P. X standard.

Thus by the direct and indirect methods of comparison very similar averages are obtained and the present standard for Tr. Digitalis is shown to be roughly 50% stronger than the U. S. P. X standard instead of the 20% or 25% stronger which we had reason to expect. No data on U. S. P. X standard ouabain are presented in the recent paper by Edmunds so that no comparison can be made from this standpoint.

Having determined experimentally by two groups of independent data a relationship between the two latest U. S. P. standards for Tr. Digitalis, assays will be submitted in Table III bearing on the second objective of this paper, *i. e.*, What is the activity relationship of the International, the Canadian and the U. S. P. XI standards for Tr. Digitalis?

Comparative data by the official One-Hour Frog Method on the International Standards of 1926 and 1928 as regular tinctures and the Canadian, U. S. P. XI and International 1936 as *corrected* tinctures will be submitted though it now seems apparent that the International Standard of 1928 was a British Standard for the B. P. 1932 and is identical with the International Standard 1936 which, however, bears a correction factor of 0.80 to make it conform to the 1926 International Standard.

TABLE III.—COMPARISON OF FOUR DIGITALIS STANDARDS.

1 International 1926 (No Factor) 3 Canadian Corr. (0.85 and 1.05 Factor)
2 U. S. P. XI Corrected (0.745 Factor) 4 British 1928 or Inter. 1936 (0.80 Factor)

Date.	Products.	U. S. P. One-Hour Frog Method. M. S. D. and Curve Number.	Potency.
6/15/36	2 *vs.* 1	0.0040 cc. (4.03) at 0.0065 cc. (4.03)	163% of Inter. Std. 1926
8/12/36	2 *vs.* 1	0.0055 cc. (4.03) at 0.0060 cc. (4.22)	104% " " " "
11/25/36	2 *vs.* 1	0.0045 cc. (4.03) at 0.0065 cc. (4.03)	145% " " " "
4/24/37	2 *vs.* 1	0.0070 cc. (4.25) at 0.0075 cc. (3.90)	117% " " " "
5/25/37	2 *vs.* 1	0.0070 cc. (4.10) at 0.011 cc. (3.95)	164% " " " "
5/22/37	2 *vs.* 1	0.0085 cc. (3.90) at 0.010 cc. (3.90)	118% " " " "

Av. of 6 tests is 135% (U. S. P. XI is of Inter. Std. 1926) or the 1926 Inter. Std. is 76% of U. S. P. XI Standard.

6/15/36	3 *vs.* 1	0.0050 cc. (4.10) at 0.0065 cc. (4.03)	132% of Inter. Std. 1926
6/13/36	3 *vs.* 1	0.0050 cc. (3.76) at 0.0065 cc. (4.03)	121% " " " "
4/24/37	3 *vs.* 1	0.0080 cc. (3.98) at 0.0075 cc. (3.90)	96% " " " "
5/25/37	3 *vs.* 1	0.0090 cc. (3.95) at 0.011 cc. (3.95)	122% " " " "

Av. of 4 tests is 118% (Canadian Std. is of Inter. Std. 1926) or the 1926 Inter. Std. is 85% of Canadian Standard.

8/5/36	4 *vs.* 1	0.0065 cc. (4.32) at 0.0050 cc. (3.90)	85% of Inter. Std. 1926
8/13/36	4 *vs.* 1	0.0060 cc. (4.00) at 0.0060 cc. (4.22)	95% " " " "
11/28/36	4 *vs.* 1	0.0055 cc. (4.00) at 0.0065 cc. (4.03)	177% " " " "
4/24/37	4 *vs.* 1	0.0075 cc. (4.18) at 0.0075 cc. (3.90)	108% " " " "
5/25/37	4 *vs.* 1	0.0080 cc. (4.00) at 0.011 cc. (3.95)	139% " " " "

Av. of 5 tests is 109% (Inter. Std. 1936 is of 1926) or the 1926 Inter. Std. is 92% of the 1936 Inter. Standard.

4/24/36	3 *vs.* 2	0.0045 cc. (4.10) at 0.0035 cc. (4.18)	77% of U. S. P. XI Std.
6/13/36	3 *vs.* 2	0.0050 cc. (4.10) at 0.0040 cc. (4.03)	81% " " "
6/15/36	3 *vs.* 2	0.0050 cc. (3.76) at 0.0040 cc. (4.03)	74% " " "
4/24/37	3 *vs.* 2	0.0080 cc. (3.98) at 0.0070 cc. (4.25)	82% " " "
5/25/37	3 *vs.* 2	0.0090 cc. (3.95) at 0.0070 cc. (4.10)	75% " " "

Av. of 5 tests is 78% (Canadian Std. is of U. S. P. XI Std.) or the U. S. P. XI Std. is 128% of the Canadian Standard.

8/12/36	4 *vs.* 2	0.0060 cc. (4.00) at 0.0055 cc. (4.03)	90% of U. S. P. XI Std.
11/4/36	4 *vs.* 2	0.0055 cc. (4.00) at 0.0045 cc. (4.03)	81% " " "
11/25/36	4 *vs.* 2	0.0060 cc. (4.18) at 0.0050 cc. (4.10)	85% " " "
3/25/37	4 *vs.* 2	0.0055 cc. (4.50) at 0.0060 cc. (4.22)	116% " " "
4/24/37	4 *vs.* 2	0.0075 cc. (4.18) at 0.0070 cc. (4.25)	91% " " "
5/25/37	4 *vs.* 2	0.0080 cc. (4.00) at 0.0070 cc. (4.10)	85% " " "

Av. of 6 tests is 91% (Inter. Std. 1936 is of U. S. P. XI Std.) or U. S. P. XI Std. is 110% of the 1936 Inter. Standard.

TABLE III.—*Continued from page 185.*

4/24/37	4 *vs.* 3	0.0075 cc. (4.18) at 0.0080 cc. (3.98)	112% of Canad. Std.
5/25/37	4 *vs.* 3	0.0080 cc. (4.00) at 0.0090 cc. (3.95)	112% " " "

Av. of 2 tests is 112% (Inter. Std. 1936 is of Canadian Std.) or the Canadian Standard is 89% of the 1936 Inter. Standard.

From these 28 tests covering a period of about 15 months the following averages were obtained as a direct comparison with the 11 tests covering a period of 10 days as reported by Dr. Edmunds in his Table I.

International standard powder 1926 considered as	100%
U. S. P. XI standard powder No. 915921, *corrected* (0.745)	135%
International 1928 and 1936 standard, *corrected*	109%
Canadian standards, *corrected* (0.85 and 1.05)	118%

Thus about the same figure is obtained for the U. S. P. XI powder, even after using a high correction factor in preparing the extract for test, as was obtained by Dr. Edmunds on the same powder but uncorrected.

Since the Four-Hour Frog Method is quite similar to the Lethal Dose Frog method only data on the various standards by the latter method are submitted in Table IV.

TABLE IV.—COMPARISON OF FOUR DIGITALIS STANDARDS.

1 International 1926 (No Factor)
2 U. S. P. XI, Corrected (0.745 Factor)
3 Canadian Corr. (0.85 and 1.05 Factor)
4 British 1928 or Inter. 1936 (0.80 Factor)

Date.	Products.	Lethal Dose or Twelve-Hour Frog Method. L. D. and Curve Number.	Potency.
3/12/36	2 *vs.* 1	0.0050 cc. (4.20) at 0.0060 cc. (4.02)	125% of Inter. Std. 1926
5/14/36	2 *vs.* 1	0.0050 cc. (3.80) at 0.0070 cc. (3.90)	136% " " " "
6/18/36	2 *vs.* 1	0.0040 cc. (3.90) at 0.0070 cc. (4.00)	170% " " " "
7/23/36	2 *vs.* 1	0.0045 cc. (4.00) at 0.0070 cc. (4.50)	138% " " " "
8/14/36	2 *vs.* 1	0.0055 cc. (4.32) at 0.0060 cc. (4.18)	113% " " " "
11/6/36	2 *vs.* 1	0.0040 cc. (4.25) at 0.0070 cc. (3.98)	186% " " " "
12/3/36	2 *vs.* 1	0.0030 cc. (3.68) at 0.0040 cc. (3.68)	133% " " " "
4/20/37	2 *vs.* 1	0.0036 cc. (4.22) at 0.0045 cc. (4.22)	125% " " " "
6/4/37	2 *vs.* 1	0.0040 cc. (3.83) at 0.0065 cc. (3.98)	156% " " " "

Av. of 9 tests is 142% (U. S. P. XI is of Inter. Std. 1926) or Inter. Std. 1926 is 72% of U. S. P. XI Standard.

6/18/36	3 *vs.* 1	0.0060 cc. (3.80) at 0.0070 cc. (4.00)	111% of Inter. Std. 1926
7/23/36	3 *vs.* 1	0.0050 cc. (4.10) at 0.0070 cc. (4.50)	127% " " " "
4/19/37	3 *vs.* 1	0.0036 cc. (3.90) at 0.0045 cc. (4.10)	119% " " " "
4/20/37	3 *vs.* 1	0.0036 cc. (3.80) at 0.0045 cc. (4.22)	112% " " " "
6/4/37	3 *vs.* 1	0.0060 cc. (4.25) at 0.0065 cc. (3.98)	115% " " " "

Av. of 5 tests is 117% (Canadian Standard is of Inter. Std. 1926) or 1926 is 85% of Canadian Standard.

8/14/36	4 *vs.* 1	0.0050 cc. (4.32) at 0.0060 cc. (4.18)	125% of Inter. Std. 1926
12/3/36	4 *vs.* 1	0.0035 cc. (4.32) at 0.0040 cc. (3.68)	134% " " " "
4/20/37	4 *vs.* 1	0.0045 cc. (4.22) at 0.0045 cc. (4.22)	100% " " " "
6/4/37	4 *vs.* 1	0.0055 cc. (3.98) at 0.0065 cc. (3.98)	118% " " " "

Av. of 4 tests is 119% (Inter. Std. 1936 is of 1926) or 1926 Inter. Std. is 84% of the 1936 Inter. Std.

3/2/36	3 *vs.* 2	0.0050 cc. (3.87) at 0.0035 cc. (3.78)	71% of U. S. P. XI Std.
6/18/36	3 *vs.* 2	0.0060 cc. (3.80) at 0.0040 cc. (3.90)	65% " " "
7/23/36	3 *vs.* 2	0.0050 cc. (4.10) at 0.0045 cc. (4.00)	92% " " "
8/14/36	3 *vs.* 2	0.0065 cc. (4.18) at 0.0055 cc. (4.32)	82% " " "
4/19/37	3 *vs.* 2	0.0036 cc. (3.90) at 0.0036 cc. (4.22)	92% " " "
4/20/37	3 *vs.* 2	0.0036 cc. (3.80) at 0.0036 cc. (4.22)	90% " " "
6/4/37	3 *vs.* 2	0.0060 cc. (4.25) at 0.0040 cc. (3.83)	74% " " "

Av. of 7 tests is 81% (Canadian Std. is of U. S. P. XI Std.) or the U. S. P. XI Std. is 123% of the Canadian Standard.

8/14/36	4 *vs.* 2	0.0050 cc. (4.32) at 0.0055 cc. (4.32)	110% of U. S. P. XI Std.
12/3/36	4 *vs.* 2	0.0035 cc. (4.32) at 0.0030 cc. (3.68)	99% " " "
4/20/37	4 *vs.* 2	0.0045 cc. (4.22) at 0.0036 cc. (4.22)	80% " " "
6/4/37	4 *vs.* 2	0.0055 cc. (3.98) at 0.0040 cc. (3.83)	76% " " "

Av. of 4 tests is 91% (Inter. Std. 1936 is of U. S. P. XI Std.) or the U. S. P. XI Std. is 110% of the 1936 Inter. Standard.

8/14/36	4 *vs.* 3	0.0050 cc. (4.32) at 0.0065 cc. (4.18)	134% of Canad. Std.
4/19/37	4 *vs.* 3	0.0045 cc. (4.10) at 0.0036 cc. (3.90)	84% " " "
4/20/37	4 *vs.* 3	0.0045 cc. (4.22) at 0.0036 cc. (3.80)	89% " " "
6/4/37	4 *vs.* 3	0.0055 cc. (3.98) at 0.0060 cc. (4.25)	102% " " "

Av. of 4 tests is 102% (Inter. Std. 1936 is of Canadian Std.) or the Canadian Std. is 98% of the 1936 Inter. Standard.

From these 33 tests covering a period of 15 months the following averages may be tabulated for direct comparison with the 10 tests reported by Dr. Edmunds in his Table III and covering only a winter period of two and one-half months:

International standard powder 1926 considered as	100%
U. S. P. XI standard powder No. 915921, *corrected* (0.745)	142%
International 1928 and 1936 standard, *corrected*	119%
Canadian standards, *corrected* (0.85 and 1.05)	117%

In this series of tests by the lethal dose frog method there is a marked discrepancy between our 142% and Dr. Edmunds' 191.4% average for the relation of the U. S. P. XI standard to the International standard of 1926, but if the correction factor, 0.745 is applied to the 191.4% a result of 142.6% is obtained which is surprisingly close to the average actually obtained in our tests.

Comparison can now be made between average potencies determined by the two frog methods on the various digitalis standards. Table V gives all the relationships established experimentally.

TABLE V.

Digitalis Standard.	One-Hour Frog.	Twelve-Hour Frog.
International 1926	Taken as 100%	Taken as 100%
U. S. P. XI, corrected	135%	142%
Canadian, corrected	118%	117%
International 1936 corrected	109%	119%
U. S. P. X	83%	.....
U. S. P. XI *vs.* Canadian	128%	123%
U. S. P. XI *vs.* Inter. 1936	110%	110%
Inter. 1936 *vs.* Canadian	112%	102%

Throughout this table there is a very remarkable correlation of results on the same standards by the two frog methods. This was to be expected as it is a fundamental principle of physiological assay that a relationship between a standard and an unknown or between two standards as determined by two different but highly analogous methods should agree within the limits of experimental error of the methods. This agreement was not found by Dr. Edmunds and no very satisfactory explanation for the discrepancy was advanced.

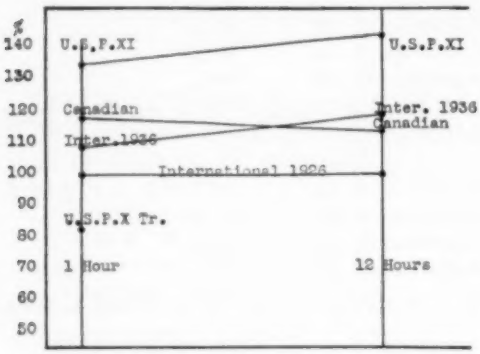


Fig. 1.—Potency of the various standards in terms of the International 1926 by the one-hour and twelve-hour frog methods.

Graphically our results may be placed in one figure which would be comparable to No. 2 in the Edmunds article.

This shows the relation of five digitalis standards by the one-hour frog method and four of them by the twelve-hour method. The figure also shows graphically the small variation in potency of the same standard by the different methods.

The mean L. D. 50 in mg. per Kg. was also calculated for a series of three comparable tests by both methods and this shows a decrease in the twelve-hour dose over the one-hour dose but it is not as great as might be expected. The reduction is nothing like as great as that reported by Edmunds and is greatest for the 1936 International standard and least for the U. S. P. XI standard.

TABLE VI.—MEAN L. D. 50 IN MG. PER KG. OF FROG.

Standard.	M. S. D. Method.	M. L. D. Method.	Decrease.
International 1926	619 mg.	551 mg.	10.98%
U. S. P. XI	463 mg.	423 mg.	8.64%
Canadian	577 mg.	522 mg.	9.53%
International 1936	575 mg.	481 mg.	16.35%

Some years ago we found an average decrease for the M. L. D. dose over the M. S. D. dose of about 20% so that the present decrease ranging from about 9% to 16% is not so very different.

Our experimental data indicate strongly from four different standpoints that the U. S. P. XI standard digitalis powder is definitely more active than it is claimed to be and consequently the U. S. P. XI standard for Tr. Digitalis is a relatively high standard. Our averages show it to be 151% of the U. S. P. X standard by direct comparison, 153% of the U. S. P. X standard by indirect comparison, 135% of the International standard by direct comparison using the one-hour frog method and 142% when using the twelve-hour frog method.

It has also been shown that comparable results can be obtained within the limits of experimental error of the methods on tests of the same standards by both the one-hour and the twelve-hour frog methods.

SUMMARY.

1. The U. S. P. XI standard for Tr. Digitalis has been found experimentally both by direct and indirect comparison to be about 50% stronger than the U. S. P. X standard rather than 20% or 25% stronger as was expected.

2. The U. S. P. XI digitalis standard actually is not just equal to the International digitalis standard but is apparently nearly 25% stronger as shown by direct comparisons using two analogous methods.

3. The Canadian standard is slightly stronger than the International standard but definitely less active than the U. S. P. XI digitalis standard.

4. Very comparable results were obtained by the one-hour and the twelve-hour frog methods for the activity relationship between any two of the several official standards examined.

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THE SIGNIFICANCE OF SUGAR COMPONENT IN THE MOLECULE OF CARDIAC GLYCOSIDES.*

BY K. K. CHEN, E. BROWN ROBBINS AND HAROLD WORTH.[1]

According to literature, the aglycone appears to have a lower activity than its parent glycoside. Thus, digitoxigenin in frogs is about one-half, and "cymarigenin" about one-third, as potent as digitoxin and cymarin, respectively, as shown by Straub (1). Although Rothlin (2) indicated that the ratio of activity between scillaren A and scillaridin A is 10:1, Stoll (3) recently admitted, "Scillaridin A is so sparingly water soluble that, up to the present time, it has not been possible to test its physiological activity." Digoxigenin is almost one-eleventh as active as digoxin, as reported by Smith (4). Oleandrigenin, however, is only slightly less effective than folinerin (25:24) according to Flury and Neumann (5).

The purpose of this paper is to present data obtained with five aglycones, strophanthidin, digoxigenin, digitoxigenin, scillaridin A and calotropagenin, and to compare them with those of their parent glycosides, cymarin, digoxin, digitoxin, scillaren A and calotropin, respectively. Our sample of strophanthidin, isolated from *Strophanthus Kombé*, was generously supplied by Dr. Walter A. Jacobs, the Rockefeller Institute for Medical Research, New York City; that of digoxigenin by Dr. Sidney Smith of London, England, through the kindness of Howard B. Fonda, Experimental Research Laboratories, the Burroughs Wellcome and Company, Tuckahoe, New York; that of digitoxigenin by Dr. Rudolf Tschesche, Berlin, Germany; that of scillaridin A by Dr. Arthur Stoll of Basel, Switzerland, through the kindness of E. W. Marti, Sandoz Chemical Works, Inc., New York City; and that of calotropagenin by Dr. Gerhard Hesse, München, Germany.

The experimental procedures were the same as those previously reported (6). Since success depends upon the solubility of these substances in an inert medium, considerable care was taken in making the solutions—needless to say, the aglycones are comparatively less soluble in water than the glycosides. For a 1:1000 concentration, strophanthidin and calotropagenin required 19 per cent ethyl alcohol by volume, digoxigenin 27.5 per cent, and digitoxigenin 38 per cent. It was necessary to increase the alcoholic content of a 1:500 concentration—38 per cent for digoxigenin and 47.5 per cent for digitoxigenin. Much difficulty was encountered with scillaridin A, for in absolute alcohol it settled out in the concentration of 1:1000. It was finally decided to employ a 1:2000 solution in methanol. For the determination of the cat unit, intravenous injections were

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* Scientific Section, A. PH. A., New York meeting, 1937.

[1] From the Lilly Research Laboratories, Indianapolis, Indiana.

made by means of a three-way glass stop-cock, as shown in Fig. 1. The drug was not introduced continuously as with other substances, but was administered intermittently from a burette, 0.1 cc. every 30 seconds, each time followed by 1 cc. of saline solution from another burette. Ether anesthesia was reduced as experiment progressed. By this method, scillaridin A produced a typical digitalis-like poisoning, which finally caused the death of the animal. Control experiments with the same or a larger volume of methanol injected in like manner showed no fatalities in a group

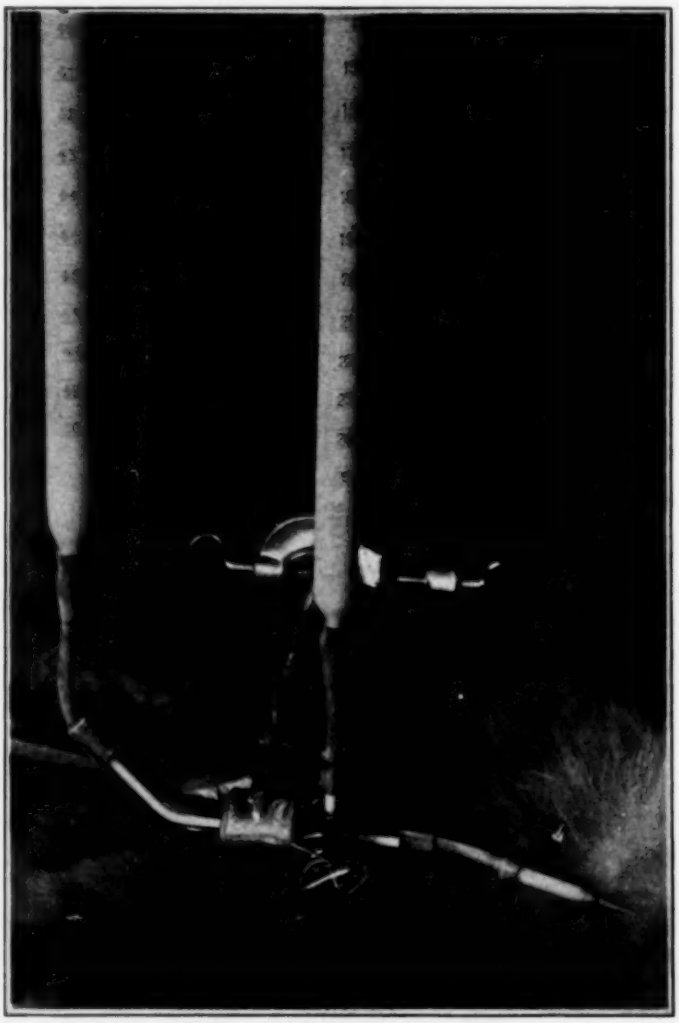

Fig. 1.—Arrangement for the intravenous injection of scillaridin A in cats. The 25-cc. burette contains a 0.05 per cent solution of scillaridin A in methanol, and the 50-cc. burette the saline solution.

of normal cats. However, a volume of 0.2 to 0.4 cc. of methanol per Kg. of body weight, rapidly injected at once, resulted in prompt deaths of the cats. It was thus not possible to determine the minimal emetic dose; nor the minimal systolic dose in frogs, for the same reason.

The results of the aglycones are summarized in Tables I, II and III, and are compared with those of their parent glycosides, which were published previously (6), (7), in Table IV. It should be noted (Table IV) that the splitting of sugar reduces the cardiac activity in every case. The

diminution of potency is much greater in frogs than in cats. Thus, the ratio of activity between cymarin and strophanthidin is approximately 3:1 in cats, but $4^1/_2$:1 in frogs. These figures are not identical with, but tend in the same direction as, those reported by Straub (1) and Dresbach (8). Similarly, the ratio between digoxin and digoxigenin is about 2:1 in cats but $11^1/_2$:1 in frogs,

TABLE I.—CAT UNITS OF STROPHANTHIDIN, DIGOXIGENIN, DIGITOXIGENIN, CALOTROPAGENIN AND SCILLARIDIN A.

Drug.	Cat Number.	Sex.	Body Weight, Kg.	Fatal Dose, Mg. per Kg.
Strophanthidin	1656	F	2.426	0.225
	1657	M	2.271	0.243
	1658	M	2.522	0.594
	1659	F	2.192	0.361
	1660	F	2.314	0.631
	1661	F	1.900	0.507
	1662	F	2.222	0.408
	1663	F	2.176	0.176
	1664	M	1.961	0.188
	1665	M	2.030	0.306
	1666	F	2.003	0.431
	1667	F	2.223	0.271
	1668	F	1.883	0.237
	1669	M	2.117	0.234
	1670	M	2.888	0.569
	1671	F	2.080	0.370
Digoxigenin	1729	M	1.837	0.775
	1730	F	1.846	0.550
	1731	F	1.832	0.783
	1735	F	1.894	0.419
	1736	F	2.760	0.313
	1737	M	2.500	0.867
	1738	M	1.913	0.431
	1739	F	1.937	0.244
	1740	M	2.147	0.354
	1741	M	2.472	0.354
	1742	F	1.865	0.317
	1743	M	1.992	0.409
	1744	F	2.024	0.314
	1745	M	1.943	0.626
	1746	F	1.630	0.481
	1747	M	1.614	0.337
Digitoxigenin	1706	M	2.073	0.442
	1707	F	2.035	0.433
	1708	F	2.407	0.254
	1709	F	2.673	0.609
	1710	F	1.965	0.480
	1711	M	2.465	0.432
	1712	F	2.330	0.572
	1713	F	2.449	0.497
	1714	M	2.565	0.409
	1715	M	1.907	0.579
Calotropagenin	1875	M	1.903	1.540
	1877	F	1.988	1.937
	1878	M	2.625	3.836
	1879	F	2.510	2.084
	1884	F	1.848	3.636
	1885	F	2.028	2.233
	1886	F	1.867	2.769
	1887	F	1.846	2.205
	1888	M	1.993	3.507
	1889	M	1.982	3.012
Scillaridin A	1760	F	2.150	0.814
	1761	F	1.751	2.627
	1762	M	1.722	1.509
	1763	F	1.892	1.771
	1865	F	1.893	1.778
	1866	F	1.817	1.853
	1867	M	2.780	2.014
	1868	M	2.003	1.781
	1869	M	2.358	1.399
	1874	F	2.416	1.656

TABLE II.—MINIMAL SYSTOLIC DOSES OF STROPHANTHIDIN, DIGOXIGENIN, DIGITOXIGENIN AND CALOTROPAGENIN IN FROGS.

Drug.	Solution.	Dose, Mg. per Kg.	No. in Systolic Standstill/No. of Frogs Used.
Strophanthidin	1:2000	0.00091	0/4
		0.00182	0/4
		0.00227	2/8
		0.00273	3/4
		0.00318	4/4
		0.00364	4/4
		0.00409	4/4
		0.00455	4/4

TABLE II.—*Continued from page 191.*

	1:2000	0.00250	0/4
		0.00333	0/4
		0.00417	0/4
		0.00500	0/4
Digoxigen	1:1000	0.01000	0/4
	1:500	0.02500	1/4
		0.02916	3/4
		0.03333	3/4
		0.04167	4/4
Digitoxigenin	1:500	0.05000	1/4
		0.05833	1/4
		0.06667	3/4
		0.07500	4/5
		0.08333	3/4
		0.09167	4/4
		0.10000	4/4
Calotropagenin	1:1000	0.01250	0/4
		0.01667	0/4
		0.02500	0/4

TABLE III.—EMESIS AND PERSISTENCE OF ACTION OF STROPHANTHIDIN, DIGOXIGENIN, DIGITOXIGENIN AND CALOTROPAGENIN IN CATS.

Drug.	Cat Number.	Sex.	Body Weight, Kg.	Initial Dose Injected Intravenously, Mg. per Kg.	Vomiting Occurred.	Final Fatal Dose (Exclusive of Initial Dose), Mg. per Kg.	Interval between Initial and Final Fatal Doses, Hours.
Strophanthidin	1697	M	1.880	0.070	0	*	.
	1700	F	2.227	0.070	+	*	..
	1701	F	1.917	0.070	0	*	..
	1696	M	3.016	*0.080*	+	*	..
	1698	F	2.574	*0.080*	0	*	..
	1699	M	1.863	*0.080*	+	0.341	4.0
	1693	F	2.325	0.090	0	*	..
	1694	M	2.037	0.090	+	0.243	4.0
	1695	M	2.171	0.090	+	*	..
	1673	M	2.561	0.100	0	0.308	1.0
	1691	F	2.043	0.100	+	0.256	7.4
	1692	F	2.270	0.100	+	0.367	4.5
	1688	M	2.194	0.110	0	0.344	6.7
	1698	F	2.506	0.110	+	0.196	7.0
	1690	F	1.991	0.110	+	0.182	6.0
	1687	M	2.240	0.120	+	0.437	7.7
	1674	F	2.184	0.140	+	0.401	3.0
	1672	F	2.447	0.180	+	0.185	67.5
Digoxigenin	1749	F	2.167	0.030	0	*	..
	1750	M	2.531	0.040	0	*	..
	1751	M	2.838	0.040	0	*	..
	1748	M	2.691	*0.050*	+	1.290	1.0
	1752	M	3.080	*0.050*	+	0.683	4.5
	1733	F	2.465	0.100	+	0.340	16.0
	1734	F	1.752	0.150	+	0.589	16.5
	1732	M	2.326	0.200	+	0.459	21.0

Digitoxigenin	1717	M	1.920	0.100	0	0.371	1.0
	1725	F	2.105	0.100	+	*	..
	1727	F	1.927	0.100	0	*	..
	1724	F	1.944	*0.110*	+	0.964	17.0
	1726	F	2.341	*0.110*	0	0.516	16.7
	1728	M	2.539	*0.110*	+	0.507	16.0
	1719	F	1.759	0.120	0	0.419	19.5
	1721	F	2.195	0.120	0	0.401	19.5
	1722	M	1.898	0.130	+	0.603	20.0
	1723	M	2.127	0.130	+	0.622	19.0
	1720	M	2.155	0.140	+	0.602	23.0
	1718	M	1.931	0.150	+	0.626	23.5
	1716	M	2.065	0.200	0	0.626	24.0
Calotropagenin	1880	F	2.271	0.100	0	*	..
	1896	F	2.208	0.150	0	*	..
	1897	F	2.352	0.175	0	*	..
	1898	M	2.671	0.175	0	*	..
	1882	F	2.512	*0.200*	0	*	..
	1892	M	2.265	*0.200*	+	*	..
	1895	F	2.131	*0.200*	+	*	..
	1891	F	1.750	0.225	+	*	..
	1890	F	1.970	0.250	+	*	..
	1883	F	2.005	0.300	+	*	..
	1881	M	2.225	0.400	+	**	..

* Not determined.

** Found dead two days after injection.

TABLE IV.—COMPARISON OF ACTION BETWEEN FIVE CARDIAC GLYCOSIDES AND THEIR AGLYCONES.

Drug.	Cat Unit ± Probable Error, Mg. per Kg.	Frog Minimal Systolic Dose, Mg. per Gm.	Cat Minimal Emetic Dose, Mg. per Kg.
Cymarin	0.126 ± 0.003	0.00060	0.08
Strophanthidin	0.359 ± 0.025	0.00273	0.08
Digoxin	0.225 ± 0.008	0.00250	0.07
Digoxigenin	0.473 ± 0.032	0.02916	0.05
Digitoxin	0.327 ± 0.008	0.00800	0.15
Digitoxigenin	0.471 ± 0.022	0.06667	0.11
Calotropin	0.119 ± 0.002	0.00050	0.06
Calotropagenin	2.676 ± 0.169	70.02500	0.20
Scillaren A	0.150 ± 0.007	0.00070	0.10
Scillaridin A	1.720 ± 0.099	..	..

and that between digitoxin and digitoxigenin $1^1/_2$:1 in cats but $8^1/_2$:1 in frogs. More marked differences existed between the remaining two pairs of compounds investigated. For example, calotropin is $22^1/_2$ times in cats, and more than 50 times in frogs, as potent as calotropagenin, and scillaren A in cats is $11^1/_2$ times as potent as scillaridin A. This remarkable loss in cardiac activity of calotropagenin and scillaridin A is not entirely due to the deletion of the sugar molecule, but rather, is due greatly to the alteration of the aglycone molecule during the process of hydrolysis, for scillaridin A, according to Stoll (9), must be considered as the anhydro-derivative of the true aglycone since it has lost one molecule of water with the formation of a double bond. A similar reaction apparently takes place with calotropagenin (10). Incidentally, it may be pointed out here that the chemical similarity between strophanthidin and calotropagenin, as suggested by Hesse and Reicheneder (10), is not borne out by our pharmacological data.

The aglycones obviously have a higher emetic action than their parent glycosides. For example, cymarin and strophanthidin have the same minimal emetic dose in cats (Table IV), and both digoxigenin and digitoxigenin have smaller minimal emetic doses than those of digoxin and digitoxin, respectively. The prominence of the emetic action of strophanthidin has already been emphasized by Dresbach and Waddell (11). In other words, strophanthidin, digoxigenin and digitoxigenin are more powerful in causing vomiting than cymarin, digoxin and digitoxin, molecule for molecule. One may also interpret that the emetic action of this class of compounds resides in the aglycone part of the molecule. Calotropagenin, which has 1/22.5 the cardiac activity of calotropin, is 1/3.3 as emetic as the latter, showing that the decrease in heart action is much greater than the reduction of emetic action following the modification of the structure of the aglycone during hydrolysis.

The splitting of sugar from the glycoside molecule also exerts an influence upon the persistence of action. Thus, a part of 38 per cent of the cat unit of digitoxin may remain in circulation for more than 5 days in cats (12), but digitoxigenin is very rapidly eliminated as shown in Table III. Although there is no quantitative method yet available for the estimation of persistence of action, it may be stated, qualitatively, that strophanthidin and digoxigenin are also less persistent than cymarin and digoxin, respectively. Dresbach and Waddell (11) and Lenz (13) reported similar impressions on strophanthidin and digitoxigenin.

In confirmation with Straub's observations (1), it was noted that digitoxigenin caused convulsions in both cats and frogs, followed immediately by prostration. The most effective dose for cats was 0.12 mg. per Kg. and that for frogs was around 0.06 mg. per Gm. or more. Digitoxin, on the other hand, is devoid of such action in corresponding doses. One cat developed convulsions with digoxigenin in the dosage of 0.05 mg. per Kg., while the remaining animals with the same drug, as shown in Table III, were all on their feet during the period of observation (1 hour) after injection. Previously, it was pointed out that cino-bufagin (14) and cassaine (15) also induced convulsions, but with them depression and paralysis were much less prominent. It seems that the presence of sugar in the molecule of cardiac glycosides, digitoxin at any rate, tends to inhibit the initial stimulating and secondary depressing action of the aglycones upon the central nervous system.

SUMMARY.

The potency of 5 cardiac aglycones—strophanthidin, digoxigenin, digitoxigenin, calotropagenin and scillaridin A—has been carefully determined.

Each aglycone is less powerful on the heart than its parent glycoside—more pronounced in frogs than in cats. If the aglycone undergoes chemical changes during hydrolysis, as in the case of scillaridin A and calotropagenin, the cardiac action is reduced much further.

The emetic action of strophanthidin, digoxigenin and digitoxigenin, on the other hand, is greater than that of cymarin, digoxin and digitoxin, respectively, molecule for molecule. When the structure of the aglycone is modified during hydrolysis, such as calotropagenin, the emetic action is diminished, but not to the same extent as the cardiac action.

The persistence of action among the aglycones is slight; that is, they are all rapidly eliminated from the circulation. This is particularly true with digitoxigenin in contrast with digitoxin.

Digitoxigenin caused a brief initial stimulation as manifested by convulsions, followed by marked depression of the central nervous system in cats and frogs. Digitoxin has no such action in corresponding doses.

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A STUDY OF THE LEAVES OF IPOMŒA PES-CAPRÆ.*,[1]

BY B. V. CHRISTENSEN[2] AND J. A. REESE.[3]

Ipomœa Pes-Caprœ (*Convolvulaceœ*) is a denizen of nearly every tropical beach (1), the world over. Harshberger (2) regards it as the character plant of the low beaches. It is a perennial plant with a tough woody root as thick as a finger and many feet in length (3). From the enlarged crown of the root grow a number of creeping stems, fleshy and purplish when young, but becoming woody as they mature. The leaves are thick, and the entire plant is mucilaginous. The shape of the leaf is indicated by the name of the plant.

The plant has several scientific names and many colloquial names. Small (4) describes it under *Ipomœa Pes-Caprœ* (L) Sweet. The Index Kewensis (5) gives *Ipomœa Pes-Caprœ*, *Ipomœa biloba*, *Ipomœa maritima*, *Ipomœa bilobata* and *Convolvulus brasiliensis* as synonymous names. Gerth van Wijk (6) lists a number of colloquial names under *Ipomœa biloba*. Bailey (7) considers *Ipomœa Pes-Caprœ*, Roth as synonymous with *Ipomœa maritima*, R. Br. Wehmer (8) gives *Convolvulus brasiliensis* (L) as a synonym for *Ipomœa maritima* R. Br.

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* Scientific Section, A. PH. A., New York meeting, 1937.

[1] Abstract of Thesis submitted in partial fulfilment of the Degree Master of Science in Pharmacy.

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According to Dymock (3) the whole plant, locally named, "Murja Devi," is used in India externally in rheumatism in the form of decoction, and internally in colic. Recently, extracts of the powdered leaves, in the form of an ointment, have been used in several hospitals for the treatment of bed sores. Excellent results are supposed to have resulted from the use of these ointments.

EXPERIMENTAL.

For the present investigation a quantity of leaves of *Ipomæa Pes-Capræ* was collected at Jacksonville Beach, Cedar Keys and St. Augustine, Florida, in October and November of 1935. After confirming the identity of the species, the leaves were carefully freed from petioles and dried indoors. The material was ground and passed through a number 20 sieve. The ground leaves weighed 12 Kg.

A representative sample was analyzed for moisture and ash.

	Per Cent.				
Sample	A	B	C	D	Average
Total ash	11.46	11.39	11.68	11.60	11.53
Acid-insoluble ash	0.95	0.91	0.98	0.96	0.95
Moisture by oven method (U. S. P. XI)	8.72	8.56	..	..	8.64
Moisture by toluene method (U. S. P. XI)	8.92	8.95	..	..	8.94

By way of preliminary examination several tests were undertaken to determine the general character of the constituents:

1. Test for alkaloid by extracting with warm 1 per cent hydrochloric acid, negative.

2. A portion of the drug was shaken strongly with distilled water containing a little sodium carbonate. No characteristic froth, that might indicate the presence of saponins, was produced.

3. One hundred grams of drug, examined by the "Stas-Otto Method," gave negative tests for alkaloid and glucoside.

4. A quantity of mucilage was precipitated from an infusion made from 200 Gm. of the drug by the addition of an equal volume of alcohol. Upon drying it was converted into an insoluble mass. After removal of the mucilage, the solution readily reduced Fehling's solution. The solution was concentrated on a water-bath and treated with lead acetate and basic lead acetate and the precipitates decomposed with hydrogen sulfide and separately examined, but all tests for glucoside and saponin were negative.

5. Two 50-Gm. samples of the powdered drug were shaken with 500 cc. of petroleum benzin and allowed to stand, with occasional agitation, for eight days. An aliquot portion of the clear supernatant liquid was decanted and allowed to evaporate at room temperature. After drying to constant weight over sulfuric acid, the per cent of extractive was determined. The remainder of the petroleum benzin solution was filtered off from the drug, and the samples, which had been extracted with petroleum benzin, freed from the solvent and extracted successively with ether, alcohol and distilled water in the same manner as with petroleum benzin. The drug was freed each time of the preceding solvent; an aliquot portion of each extraction evaporated on a water-bath.

	Per Cent.		
Sample	A	B	Average
Petroleum benzin (b. p. 30°–40°)	3.76	3.66	3.71
Ether	1.52	1.51	1.52
Alcohol	9.41	9.63	9.52
Distilled water	24.75	23.68	24.22
Total	39.44	38.48	38.97

6. Two 40-Gm. samples of the powdered leaves were extracted in Soxlet extractors with the following liquids. After removal of the solvent the residual extracts were kept over sulfuric acid until of constant weight.

	Per Cent.		
Sample	A	B	Average
Petroleum benzin (b. p. 30°–40°)	3.78	3.80	3.79
Ether	1.98	2.06	2.02
Alcohol	20.00	18.64	19.32
Distilled water	7.20	7.62	7.41
Total	32.96	32.12	32.54

7. Various quantities of the several extracts were administered to small dogs weighing about 4 Kg., at intervals of from two to four days, and in no case was there any noticeable effect attributable to the drug. The maximum quantity of each extract, administered separately in a single dose, was 1 Gm. of the petroleum benzin extract, 1 Gm. of the ether extract, 2 Gm. of the alcoholic extract and 2 Gm. of the aqueous extract.

ANTISEPTIC DETERMINATION OF OINTMENTS.

Since this investigation was begun because of the use of ointments made from the powdered drug and extracts of the drug, it was decided to determine the antiseptic value of ointments made from extracts of the drug. A quantity (1 Kg.) of the powdered leaves was extracted successively in a large modified Soxhlet apparatus with petroleum benzin (b. p. 30°–40°), ether, alcohol and distilled water. After removal of the solvents, the extracts were kept in a desiccator over calcium chloride until used in the preparation of the various ointments. All the ointments used in the tests were made using U. S. P. Petrolatum as the base. The method used for testing was the agar-plate method of the U. S. Department of Agriculture (9) and *Staphylococcus aureus* was used as the test organism.

Petroleum Benzin Extract.—Ointments representing, in terms of petroleum benzin extractive, 10, 15, 20, 25, 50, 100 and 200 per cent of the strength of the drug showed no inhibitory (antiseptic) action. These tests, as all the succeeding ones, were run with two strains of *Staphylococcus aureus*.

Alcoholic Extract.—Ointments representing, 10, 15, 25 and 50 per cent of the strength of the drug showed no inhibitory action.

Ether Extract.—Ointments representing 10, 25, 50 and 100 per cent of the drug had no inhibitory action.

Aqueous Extract.—Ointments representing 12, 25 and 50 per cent of the strength of the drug were prepared. The organisms grew adjacent to and in some cases under the test ointment.

Petrolatum Extract.—Since an ointment had been used made by heating the leaves with petrolatum and straining, two ointments were prepared by this method. Ten grams of the powdered leaves were heated for one hour on a boiling water-bath with 90 Gm. of petrolatum, and strained. This ointment showed no antiseptic action. An ointment was made in the same manner using 20 Gm. of the powdered leaves and 80 Gm. of petroleum. This ointment, likewise, showed no inhibitory action.

LARGE SCALE EXTRACTION.

For the purpose of a more complete examination a quantity (9 Kg.) of the powdered leaves was extracted by continuous percolation with petroleum benzin (b. p. 30°–40°), and after removal of this solvent, extracted by continuous percolation with hot alcohol. The petroleum extract, after removal of the solvent, weighed 330 Gm. The alcoholic extract, after removal of the solvent, weighed 1325 Gm.

Examination of the Petroleum Benzin Extract.—One hundred and fifty grams of this extract were dissolved in a large volume of ether and shaken successively with aqueous ammonium carbonate, aqueous potassium carbonate and finally with a 10 per cent solution of potassium hydroxide. The alkaline extracts were decomposed with diluted sulfuric acid and the liberated substances removed with ether. The ammonium carbonate and potassium carbonate extractives consisted of traces of resinous material. The potassium hydroxide extractive, however, consisted of several Gm. of a black, oily liquid. After repeated attempts to obtain a crystalline material, a white flocculent material precipitated from hot ethyl acetate on cooling. This melted at 86°–88° C.

When boiled with acetic anhydride for one hour under a reflux condenser, it separated on cooling the solution; the melting point was not changed.

Examination of the Alcoholic Extract.—The alcoholic extract was mixed with water and steam passed into the mixture until the volatile products were removed. The distillate, which contained oily drops floating on the surface, was extracted with ether. The ethereal solution was dried with anhydrous sodium sulfate and the solvent removed, when a small amount (0.25 Gm.) of a pale yellow, volatile oil was obtained. This possessed a persistent odor and gave the color reactions of furfural.

After the steam distillation there remained in the distillation flask a dark-colored liquid (A) and a quantity of soft, dark, resinous mass (B). The resinous mass was repeatedly washed with hot water until the washings were colorless and the latter were added to the main portion of the aqueous liquid.

Examination of the Aqueous Liquid (A).—The aqueous liquid which had been separated from the resinous mass amounted to about 4 liters, and was acid to litmus. It was concentrated at a low temperature and repeatedly extracted with ether. The combined ethereal shakings were successively shaken with 5 per cent ammonium carbonate, 5 per cent potassium carbonate and 10 per cent potassium hydroxide solutions. The three alkaline extracts were decomposed with diluted sulfuric acid and the liberated material extracted with ether. Attempts to obtain crystalline substances failed.

The ethereal liquid, which had been extracted with the alkaline solutions, was allowed to evaporate, when a very small quantity of a pale yellow, crystalline substance was obtained. This substance was not very soluble in ether and alcohol. After washing with ether and drying it melted at 118° C. The quantity of this substance was too small to permit further investigation.

The original aqueous liquid was then repeatedly extracted with chloroform, and the combined chloroform extracts shaken with aqueous potassium hydroxide. The potassium hydroxide solution was acidified with diluted sulfuric acid and extracted with chloroform. Upon evaporation of the chloroform a light, brown residue was obtained.

The original aqueous liquid, which had been extracted with ether and chloroform, had a reddish brown color and a salty taste. It gave a green color with ferric chloride and reduced Fehling's solution. A portion of the aqueous liquid was treated with basic lead acetate and an unsuccessful attempt was made to prepare an osazone from the filtrate. Steam was then passed into the remainder of the aqueous liquid (A) in order to expel the last traces of chloroform. The liquid was treated with an excess of lead acetate, and to the filtrate from the lead precipitate a slight excess of basic lead acetate was added. The filtrate resulting from the lead precipitates, and also the lead acetate and basic lead acetate precipitates after being suspended in water were decomposed with hydrogen sulfide. The final filtrate remaining after treatment with basic lead acetate and also the solutions resulting from the decomposition of the lead precipitates were likewise examined for an active principle by shaking them separately with chloroform, and by treatment with potassium hydroxide, acidifying and extracting with ether. As the result of this treatment only bitter residues, red coloring matter and a bright yellow powder, which could not be crystallized, were obtained.

Examination of the Resinous Mass (B).—This resin, which had been separated from the aqueous liquid (A) as previously described, was mixed with purified white sand, dried and extracted in a modified Soxhlet apparatus successively with petroleum benzin (b. p. 30°–40°), ether and chloroform.

Petroleum Benzin Extract of the Resin.—This extract was a dark green, semi-solid and weighed 135 Gm. This was refluxed for four hours with saturated alcoholic potassium hydroxide and the alkaline liquid diluted with water. The alcohol was removed in a current of steam and the unsaponifiable material extracted with ether. The ethereal solution was washed with water, dried with anhydrous sodium sulfate and the solvent removed; a reddish yellow residue was obtained. This residue was dissolved in hot alcohol. On cooling an amorphous substance separated which gave the color reactions of the phytosterols.

The alkaline liquid, which had been extracted with ether, was acidified with sulfuric acid. The liberated material was collected by filtration, washed with water and as much water as possible removed from the mass by suction. The mass was transferred to a large flask and re-

fluxed with ether for several hours. The ethereal solution was filtered and the ether removed, when several Gm. of a mixture of fatty acids were obtained. They have not been identified.

Ether Extract of the Resin.—The ether extract of the resinous mass (B), after removal of the solvent and drying in a desiccator over sulfuric acid under reduced pressure, was a dark green, soft, resinous mass weighing 18 Gm. This was dissolved in hot alcohol, boiled with decolorizing charcoal and filtered. A black solution was obtained. The liquid was again boiled with decolorizing charcoal and a black solution was again obtained. The alcohol was removed; the resinous residue obtained dissolved in ether and extracted successively with ammonium carbonate, potassium carbonate and potassium hydroxide solutions. These alkaline solutions extracted only resinous material.

Chloroform Extract of the Resin.—This extract was a dark brown, resinous mass weighing 6 Gm. from which no pure substance could be obtained.

SUMMARY AND CONCLUSIONS.

1. The most important constituents of the leaves of *Ipomœa Pes-Caprœ* are: mucilage, a volatile oil, a complex resin, fat, a phytosterol, bitter substances and red coloring matter.

2. Neither the leaves nor extracts of the leaves appear to have any noticeable pharmacological activity.

3. Ointments prepared from the leaves and extracts of the leaves have no antiseptic action.

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A COMPARATIVE STUDY OF THE COLORIMETRIC, VITAMETER AND BIOLOGICAL TESTS FOR VITAMIN A.*

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Although the biological method of testing vitamin A is still considered by many to be the only absolutely reliable one, certain chemical tests and physical measurements have been very extensively used in recent years. Rosenheim and Drummond (1) reported in 1925 that arsenic trichloride gave a blue color with fish oils which was proportional to the vitamin A content. A little later Carr and Price (2) developed the antimony trichloride test. This latter procedure has been modified and improved by many and especially by Wokes and Willimott (3) and Norris and Danielson (4).

In 1928 Morton and Heilbron (5) reported that the absorption of light of 3285 Ängström units by fish liver oils and "A" concentrates ran closely parallel

* Scientific Section, A. PH. A., New York meeting, 1937.

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with the "A" content. Spectrophotometric tests have been developed and widely used. Hilger (6) developed a simple instrument, which was named a vitameter, to measure the absorption of light of about 3285 Ängström units. Although this instrument does not afford the precision of measurement of the spectrophotometer, it has been far more widely used, because of cost and convenience.

The literature on these chemical and physical tests is far too expansive to include in this report, but for the most part there has been fairly good agreement with the biological methods. However, it is felt that the data on the direct comparisons with the biological tests are limited. This laboratory has been making the antimony trichloride color test and vitameter tests along with the biological tests for a number of years and has accumulated a considerable amount of data which should be useful in determining the reliability and limitations of these various substitute methods.

Data on 115 samples of fish liver oils and concentrates are included in this study and all have been obtained since adoption of the new U. S. P. method. Earlier results have not been included because of the possible lower accuracy of the biological data. Furthermore, the results on all samples which have been tested biologically at dose levels suitable for accurate interpretations are included in this study.

EXPERIMENTAL.

Biological Method.—The U. S. P. XI (formerly U. S. P. X 1934 revision) procedure was followed in all cases. A master curve was used as an aid in interpreting the results and to increase the accuracy.

Antimony Trichloride Color Test.—In developing our method for making the color tests, advantage has been taken of the various improvements which have appeared in the literature, particularly the work of Norris and Danielson (4). The Rosenheim-Schuster tintometer was tried but found to be less satisfactory than standard color solutions, which are prepared from copper sulfate and cobalt chloride. Such color solutions were suggested by Arny and Taub (7).

The details of the method are given below:

Reagents: Chloroform—U. S. P. chloroform is treated with anhydrous calcium chloride and allowed to stand. The clear solvent is drawn off and kept under anhydrous conditions.

Antimony-Trichloride Reagent—C.P. Antimony trichloride is dissolved in anhydrous chloroform at 40° C. The solution is cooled to 20° C. and allowed to settle. The clear liquid is decanted off under as near anhydrous conditions as possible. This reagent is stored and may be used over a period of several months.

Color Standards—to 5-cc. portions of 0.5*M* $CuSO_4.7H_2O$ solution in 1% HCL, 0-, 0.1-, 0.2- and 0.3-cc. portions of 0.5*M* $CoCl_2$ in 1% HCl are added. These solutions are diluted to 10 cc. with 1% HCl. A series of color standards is prepared from these 5 solutions by adding 2-cc. portions to test-tubes of 1-cm diameter. These tubes are then sealed and may be used over a year. In fact, we have never detected any changes even after standing several years. These five tubes have different shades of red and blue and in making a test, the tube which matches the color of that produced by the sample is selected.

Procedure: Samples which contain more than 10,000 U. S. P. XI units of vitamin A are tested directly. The test is made on the unsaponifiable extract of all samples which fall below this figure. The unsaponifiable extract is prepared as follows: One gram of the oil is saponified with 10 cc. of 0.5*N* alcoholic KOH solution by boiling 5 to 10 minutes. Twenty cubic centimeters of water are added and the solution is extracted twice with 25-cc. portions of ether. The ether extracts are combined and washed once with 20 cc. of 0.5*N* KOH solution and with 10–20-cc. portions of water until free of alkali. The solution is then evaporated to dryness under anaerobic conditions and the residue is dissolved in anhydrous chloroform and is then ready for color test.

The oil or unsaponifiable fraction is diluted with anhydrous chloroform. Two-tenths cubic centimeter of the diluted sample is added to a test-tube of 1-cm. diameter and 1.8 cc. of antimony trichloride reagent is added very rapidly. A blue color develops immediately and reaches a maximum after a few seconds. This color is compared with the standard tube which best matches the shade. For most fresh oils or unsaponifiable fractions, the tube with the lowest amount of cobalt chloride gives the best match. The dilution of the sample is adjusted so that the blue color produced with antimony trichloride just matches the standard. One of these color units is equal to 6 U. S. P. XI units of vitamin A, a figure which is based on a great number of tests on the U. S. P. Reference sample.

Vitameter Test.—The regular procedure for the vitameter was followed for most of the tests. However, more recently a photographic attachment, patterned after that of Notevart (8) has been employed. Absolute alcohol and isopropyl alcohol were used as the solvent, but no differences were noted. As in the case of the color tests, the unsaponifiable fraction was used when the fish oil contained less than 10,000 U. S. P. XI units of A per Gm. For conversion of E values into U. S. P. XI units, a factor of 2000 has been used. This factor is based upon the results of a great number of tests on the U. S. P. reference cod liver oil.

DISCUSSION OF RESULTS.

Tables I to V, inclusive, contain the results of the tests on the different kinds of samples. Each table contains the vitamin A content, expressed in terms of U. S. P. XI units, as determined by the different methods, as well as the percentage differences. Table VI contains a summary of these differences and also shows the distribution of samples which show the poorest agreement with the biological tests.

TABLE I.—COD LIVER OIL.

Sample No.	U. S. P. XI Units Bio. Test.	U. S. P. XI Units Color Test.	U. S. P. XI Units Vitameter.	% Difference Color Test.	% Difference Vitameter.
957	2400	2670	2520	+11.2	+ 5
1008	2350	1990	1983	−15.3	−15.6
1017	2100	2340	2440	+11.4	+16.2
1020	2500	2560	2360	+ 2.4	− 5.6
1021	2450	2305	2320	− 5.9	− 5.3
1023	2940	2970	3050	+ 1.0	+ 3.7
1045	2640	3820	3800	+44.7	+43.8
1055	2300	1990	2100	−13.5	− 4.3
1056	3200	3170	3200	− 0.9	0
1074	6300	4170	4267	−33.8	−32.2
1097	1675	1785	1933	+ 6.5	+15.4
1107	2500	2360	2260	− 5.6	− 9.6
1109	2150	2090	2160	− 2.8	+ 0.4
1115	2300	2320	2560	+ 0.8	+11.3
1128	2300	2560	2560	+11.3	+11.3
1141	10,500	13,945	12,600	+32.8	+20
1242	1950	1985	1800	+ 1.8	− 7.7
1278	1950	1985	2000	+ 1.8	+ 2.5
1285	2075	1700	1600	−18.0	−22.8
1286	2050	1700	2000	−17.0	− 2.5
1288	1950	1700	2200	−12.3	+12.3
1290	2175	2000	1870	− 8.0	−14.0
1413	1725	1540	1600	−10.7	− 7.2
Av.				**− 0.8**	**+ 0.6**

TABLE II.—HALIBUT LIVER OILS.

Sample No.	U. S. P. XI Units Bio. Tests.	U. S. P. XI Units Color Tests.	U. S. P. XI Units Vitameter.	% Difference Color Test.	% Difference Vitameter.
958	12,000	14,720	13,700	+22.7	+14.2
966	156,000	155,560	155,650	− 0.3	− 0.3
967	76,000	67,050	57,760	−11.6	−24.0
971	130,000	125,160	113,200	− 3.7	−12.9
1002	116,000	107,280	97,020	− 7.5	−16.3
1003	116,000	110,260	94,380	− 4.8	−18.6
1009	32,250	38,740	38,800	+20.1	+20.3
1013	115,500	107,280	80,250	− 7.1	−30.5
1014	111,000	89,400	77,930	−19.4	−29.8
1058	175,000	146,615	163,680	−15.9	− 6.8
1078	202,000	177,600	156,920	−12.1	−22.3
1085	124,000	102,690	99,050	−17.2	−20.1
1089	56,300	49,010	49,820	−12.8	−11.5
1094	36,000	36,060	36,960	+ 0.1	+ 2.7
1106	65,000	53,040	44,350	−18.4	−31.7
1116	153,000	151,980	161,570	− 0.6	+ 5.6
1117	150,000	161,810	157,340	+ 7.8	+ 4.8
1166	62,500	66,750	62,000	+ 6.7	− 0.8
1251	187,500	180,580	202,000	− 3.6	+ 7.7
1252	123,000	135,290	135,000	+10.0	+ 9.7
1257	138,000	141,850	145,000	+ 2.8	+ 5.0
1258	54,000	45,830	56,000	−15.1	+ 3.7
1263	89,700	85,100	92,000	− 5.1	+ 2.5
1345	82,000	80,000	92,000	− 2.4	+12.2
1365	8,000	6,000	5,800	−25	−27.5
1399	200,000	222,480	287,500	+11.2	+43.7
1401	160,000	141,180	140,000	−11.8	−12.5
Av.				− 4.2	− 4.9

TABLE III.—FISH LIVER OIL CONCENTRATE TABTETS.*

Sample No.	U. S. P. XI Units Bio. Test.	U. S. P. XI Units Color Test.[a]	% Difference Color Test.
973	2520	2238	−11.2
975	2500	2300	− 8.0
978	2700	2200	0
987	3000	2770	− 7.7
988	3000	2450	−18.3
999	2400	2390	− 0.4
1001	3000	2380	−20.6
1007	3300	2330	−29.3
1015	2100	2290	+ 9.0
1019	2220	2450	+10.3
1030	2500	2580	+ 3.2
1041	1900	2510	+32.1
1048	2700	2600	− 3.7
1052	2350	2800	+19.1
1054	2650	2760	+ 4.1
1063	2500	2680	+ 7.2
1065	2660	2640	− 0.7
1069	2600	2480	− 4.6
1072	2300	2390	+ 3.9
1075	2550	2390	− 6.2
Av.			− 1.1

* Squibb Adex Tablets. [a] The color test gives low readings for these tablets and a correction factor of 1.2 is used in calculating these values.

TABLE IV.—FISH LIVER OIL CONCENTRATE TABLETS.*

Sample No.	U. S. P. XI Units Bio. Tests.	U. S. P. XI Units Color Tests.[a]	U. S. P. XI Units Vitameter.[b]	% Difference Color Test.	% Difference Vitameter.
1083	4500	4520	..	+ 0.4	..
1091	4300	4290	..	− 0.2	..
1098	3600	4290	..	+19.1	..
1100	4100	4400	..	+ 7.3	..
1133	4000	4290	..	+ 7.2	..
1139	4000	2760	3300	−29.3	−17.5
1151	3950	3900	..	− 1.2	..
1161	3600	3860	..	+ 7.2	..
1167	3460	3900	..	+13.0	..
1169	3850	3760	3590	− 2.3	− 6.7
1181	3700	3730	3500	+ 0.8	− 5.4
1187	4100	3900	3750	− 4.8	− 8.5
1212	3950	3750	3690	− 5.5	− 7.0
1222	4100	3900	3780	− 5.1	− 8.5
1233	4100	4290	4230	+ 4.6	+ 3.1
1238	3500	3900	4080	+11.4	+16.5
1267	3500	3400	4370	− 2.8	+24.8
1292	3600	3760	3870	+ 4.4	+ 7.9
1306	3970	3760	4080	− 5.2	+ 2.7
1307	4025	3760	4080	− 6.5	+ 1.3
1315	3780	4200	4200	+11.1	+11.1
1326	4100	4500	4000	+ 8.9	− 2.4
1331	3900	4500	4000	+15.4	+ 2.5
1344	4300	4930	4250	+14.6	− 1.2
1367	3850	3600	4060	− 6.5	+ 5.4
1374	3670	5150	5220	+40.3	+42.2
1383	3500	4500	4640	+28.5	+32.5
1396	4200	5220	4640	+24.3	+10.5
1407	4020	4230	4060	+ 5.2	+ 1.0
Av.				+ 4.8	+ 5.0

* Squibb Adex Tablets.

[a] A correction factor of 1.2 is used in calculating these values.

[b] A correction factor of 1.16 is used in calculating these values.

TABLE V.—MISCELLANEOUS FISH LIVER OILS.

Sample No.	Description.	U. S. P. XI Units Bio. Test.	U. S. P. XI Units Color Test.	U. S. P. XI Units Vitameter.	% Difference Color Test.	% Difference Vitameter.
1127	Tuna liver oil	73,000	77,480	80,250	+ 6.1	+ 9.9
1129	Tuna liver oil	109,000	96,250	89,760	−11.7	−17.6
1144	Tuna liver oil	80,000	85,225	78,140	+ 6.5	− 2.3
1171	Tuna liver oil	113,500	135,290	160,000	+19.2	+40.9
1173	Tuna liver oil	131,000	190,720	192,000	+45.6	+46.6
1253	Tuna liver oil	40,000	39,730	43,400	− 0.6	+ 8.5
1283	Tuna liver oil	53,500	47,680	51,500	+10.8	+ 3.7
1165	Tuna liver oil	39,960	39,760	.....	− 0.5	..
1215	Tuna liver oil	32,400	34,020	39,360	+ 5.0	+21.4
1369	Tuna liver oil	47,000	50,000	51,400	+ 6.4	+ 9.4
Av.					+ 8.7	+12.0

TABLE V.—*Continued from page 203.*

1136	Mixed fish liver oil	14,400	13,530	14,000	− 6.0	− 2.0
1062	Sword fish liver oil	96,700	93,570	81,310	− 3.2	−15.8
1025	Sword fish liver oil	236,000	247,930	240,130	+ 5.0	+ 1.7
995	Salmon liver oil	150,000	137,080	105,990	− 8.6	−29.3
994	Salmon liver oil	150,000	149,000	138,750	− 0.6	− 8.0
1112	Halibut liver oil concentrate	50,000	82,840	93,390	+65.6	+86.7

TABLE VI.—SUMMARY OF DIFFERENCES FROM BIOLOGICAL TESTS.

Product.	Color Test. No. of Samples.	Color Test. Greater Than ±10%.	Color Test. Greater Than ±20%.	Vitameter Test. No. Samples.	Vitameter Test. Greater Than ±10%.	Vitameter Test. Greater Than ±20%.
Cod liver oils	23	12	3	23	11	3
Halibut liver oil	27	13	2	27	16	7
Fish liver oil tablets	49	10	4	21	7	3
Other fish liver oils and concentrates	16	5	2	15	7	5
Total	115	40	11	86	41	18
%		35	9.5		47	20.7

Before making a comparison of the data it is well to consider the limits of error of the different methods. It is well known that biological tests in general are subject to considerable error. We have found that the results of twenty assays made on the same cod liver oil over a period of two years fell between limits which varied plus or minus 16 per cent of the mean. Furthermore, the color and vitameter results may vary within limits of plus and minus 4 or 5 per cent. Consequently, variations of 20 per cent may easily be explained on the basis of the errors of the methods.

On examining the data one finds very slight differences in the agreement between the chemical and physical tests and the biological tests of the different products. For the most part, however, these differences are not significant. In the case of the fish liver oil concentrate tablets, both the color and vitameter results were low, but when a correction factor was applied, the agreement becomes very good. We have no explanation of this phenomenon, but it is confirmed by the results of several hundred tests which were made before these data were collected. The biological tests invariably confirm the theoretical value, based upon the tests of the concentrates before incorporation into tablets.

With either the vitameter or the antimony trichloride test the agreement with the biological test is very good in all but a rather low percentage of cases. The color test agrees within limits of plus or minus 20% in 90 per cent of the samples while the vitameter agrees in about 80%. Our data show a slight but definite superiority in favor of the color test. Attention is called to the fact that the spectrophotometer was not used in any of the tests, and it is probable that this more sensitive instrument would have given more reliable results.

In general, we believe that our results show that the agreement between the different tests is very good. There are a few cases, regardless of the products studied, in which the variations are far beyond the limits of error of the methods. In a few of these cases the biological test has been repeated and the original results confirmed. In this connection, a sample of halibut liver oil concentrate number 1112, Table V, is very interesting. This concentrate was very old and considerable destruction had occurred. In earlier work we had noted that the color test did not give as reliable results with partially oxidized samples. In all of the other samples, however, relatively fresh fish liver oils or concentrates were tested.

There appear to be a few samples of fish liver oils or concentrates which give results either too high or too low when tested for vitamin A by either the vitameter or the color reaction with antimony trichloride. This possible lack of specificity throws doubt upon the advisability of acceptance of such tests as substitutes for the biological tests. In general the chemical and physical tests agree more closely with each other than with the biological test, and the use of both tests do not furnish a reliable index of what samples must be tested by the longer animal method.

The very good agreement in a high percentage of cases shows definitely that either test may be very useful when run in connection with the biological method. Many animals can be

saved by selection of proper doses, based upon the results of such tests. Furthermore, these results may often serve as a check upon the animal test.

SUMMARY.

1. The vitameter and antimony trichloride tests give results with a very high percentage of fish liver oils and concentrates which are in close agreement with the biological tests.

2. There are a few cases where the discrepancies are beyond the limits of error of the methods and indicate a lack of specificity of either the vitameter or color test. It is doubtful that either method can serve as an absolute substitute for the biological method.

3. Either the vitameter or color test serves a very useful purpose as a supplement to the biological test.

4. The antimony trichloride test gives results fully as reliable as the vitameter. In general both methods give results which are in close agreement with each other.

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DRUG EXTRACTION. XVI. THE EFFECT OF THE FORM OF THE PERCOLATOR ON THE EFFICENCY OF EXTRACTION.*[1]

BY WILLIAM J. HUSA[2] AND C. L. HUYCK.

Although a great many forms of percolators have been advocated in more than a century of percolation history there have been surprisingly few published reports of exact comparisons of the efficiencies of the different types. In 1878, J. U. Lloyd (1) measured the effect of varying the diameter and height of percolator tubes in the extraction of cimicifuga. He found that when maceration after packing was omitted a tenfold increase in the length of the tubes doubled the yield of extractive matter. Recently Büchi and Feinstein (2) carried out percolations of cinchona in order to determine the relative efficiencies of Oldberg percolators, funnels and cylindrical glass tubes of uniform diameter. The relative efficiencies varied somewhat at different stages of the percolation but from the standpoint of practical percolation the differences were surprisingly small. Hence it was concluded that the Oldberg percolator was as efficient as the other forms and was preferable from the standpoint of ease of packing and general convenience.

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* Scientific Section, A. PH. A., New York meeting, 1937.

[1] This paper is based on part of a dissertation presented to the Graduate Council of the University of Florida by C. L. Huyck, in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

[2] Head Professor of Pharmacy, University of Florida.

In the present study, using powdered belladonna root, percolations were carried out to compare the efficiencies of the Oldberg percolator, funnel and glass tubes of uniform diameter.

EXPERIMENTAL PART.

Except where otherwise specified the drug and menstruum used and the methods of analysis employed were the same as in a previous study (3).

The sizes of the various percolators used are shown in Table I. The tubes of lowest capacity, *i. e.*, the 2.5-cm. tubes, had a capacity of 150 Gm. of powdered belladonna root; hence this quantity of drug was used in all the percolators in order to keep this factor the same. The drug was moistened with 25 cc. of menstruum per 100 Gm. of drug, placed in the percolators in portions with agitation and packed from the top. From preliminary experiments with the narrowest tubes it was found that when the drug was packed tightly from the top about fifteen hours was required for the liquid to reach the lower orifice, and the rate of free flow averaged about 0.079 cc. per minute for the first four hours. To increase the rate of flow, the narrowest tubes were packed more lightly in this experiment so as to allow a free flow of at least 0.4 cc. per minute. The relative tightness of packing is shown by the data on volume of packed drug in Table I. After the liquid had begun to drop from the lower orifice each portion of drug was allowed to macerate for twenty and one-half hours; this time of maceration was adopted mainly for convenience, since in a previous study by the present authors (4) it was found that maceration for forty-eight hours after packing caused only a very slight increase in efficiency of extraction. Percolation was then allowed to proceed at a rate of 0.4 cc. per minute. Two reserve percolates of 60 cc. each were collected from each percolator, the total of these two reserves being equivalent to the 80% reserve usually collected in making fluidextracts by ordinary percolation. In addition to the two portions of reserve, a weak percolate of 60 cc. was collected in each case. The room temperature was about 24° C. during the experiment. Certain experimental details are shown in Table I and the assay results appear in Table II. Two percolators of each type were used and the results given in the tables are the averages of the duplicate percolations.

TABLE I.—EXPERIMENTAL DETAILS.

	Length in Cm.	Inside Diameter at Top in Cm.	Volume of Packed Drug in Cc.	Length of Drug Column in Cm.	Time Required for Liquid to Reach Lower Orifice in Minutes.
Glass tube (2.5 cm.)	90.0	2.5	410	72	220
Glass tube (4 cm.)	64.0	4.0	400	30	114
Oldberg percolator	27.3	5.7	375	17.3	90
Funnel	15.5	17.5	370	9.5	75

TABLE II.—ASSAY RESULTS.

	Gm. Total Alkaloids.				Gm. Total Extractive.			
	Reserve I.	Reserve II.	Weak Percolate.	Total.	Reserve I.	Reserve II.	Weak Percolate.	Total.
Glass tube (2.5 cm.)	0.55	0.10	0.03	0.68	9.2	8.0	6.4	23.6
Glass tube (4 cm.)	0.48	0.15	0.08	0.71	8.3	8.0	6.8	23.1
Oldberg percolator	0.60	0.15	0.03	0.78	7.8	7.8	7.2	22.8
Funnel	0.58	0.17	0.04	0.79	8.0	8.0	6.0	22.0

Comparison of Oldberg Percolator and Straight Glass Tube of Same Diameter.—Using powdered belladonna root from another shipment, percolations were carried out to compare the efficiency of the Oldberg percolator with that of a straight glass tube of approximately the same diameter. The Oldberg percolator used was the quart size having a length of 45.5 cm. and an inside diameter at the top of 7.5 cm. The glass tube was 70.5 cm. in length and had a uniform inside diameter of 6.5 cm. Portions of 500 Gm. each of belladonna root in No. 40 powder were moistened with the menstruum of 5 volumes of alcohol and 1 volume of water, 300 cc. of liquid being used to moisten each 500-Gm. portion of drug. The volume of the packed drug was approximately

1075 cc. in each case. The length of the drug column was 23 cm. in the Oldberg percolator and 28.5 cm. in the glass tube. Percolation was commenced without maceration before or after packing. In each case a first percolate of 250 cc. was collected in 23 hours and a second percolate of 250 cc. was likewise collected in 23 hours. The temperature was approximatel[illegible]uring the percolation. Analytical data on the percolates are given in Table III.

TABLE III.—COMPARISON OF OLDBERG PERCOLATOR AND STRAIGHT GLASS TUBE.

	Gm. Total Alkaloids.			Gm. Total Extractive.		
	First Percolate.	Second Percolate.	Total.	First Percolate.	Second Percolate.	Total.
Oldberg percolator	1.4	0.8	2.2	28.9	24.0	52.9
Straight glass tube	1.4	0.7	2.1	29.0	26.0	55.0

DISCUSSION OF RESULTS.

From the data in Table II both the Oldberg percolator and the funnel show more efficient extraction of alkaloids than either of the narrower glass tubes; this is true in each of the reserve portions as well as in the totals. Modern pharmacists may be surprised to note that the funnel gave just as efficient extraction of alkaloids as the Oldberg percolator, but this would not seem so strange to those pharmacists of past generations who advocated the use of funnels. The results on comparative efficiency of the Oldberg percolator, funnel and glass tubes are in general agreement with the results of Büchi and Feinstein (2).

The glass tubes gave a somewhat higher yield of total extractive in the first reserve but on the basis of the totals the difference does not appear to be of any great practical significance. The somewhat greater yield of total extractive given by the longer columns of drug is in agreement with the results of Büchi and Feinstein (2) on cinchona. In Lloyd's work on cimicifuga (1), the increased length of drug column apparently increased the yield of extractive matter more than was the case with either belladonna root or cinchona.

In the comparison of the Oldberg percolator with a glass tube of approximately the same diameter, the data in Table III show no appreciable advantage for either type.

SUMMARY.

Using powdered belladonna root, percolations were carried out to compare the efficiencies of the Oldberg percolator, funnel and glass tubes of uniform diameter. The results indicate that the Oldberg percolator and funnel gave more efficient extraction of alkaloids than narrower glass tubes, but that the latter were somewhat more efficient for the extraction of total extractive. In a comparison of the Oldberg percolator with a glass tube of approximately the same diameter, the data show no appreciable advantage for either form of percolator.

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SCIENTIFIC COLOR NAMING OF DRUGS.*,**

BY DEANE B. JUDD[1] AND KENNETH L. KELLY.[2]

The system of color names used is one worked out by the Inter-Society Color Council at the request of the AMERICAN PHARMACEUTICAL ASSOCIATION. It is based on a logical arrangement of the colors of objects. The colors are arranged in a solid figure called the color solid (see Fig. 1), the light colors being placed near the top of the solid, and dark colors near the bottom. The hues are arranged according to angle about the central vertical axis of the solid. Weak or gray colors are placed near this gray axis; strong or saturated colors far away from it. The

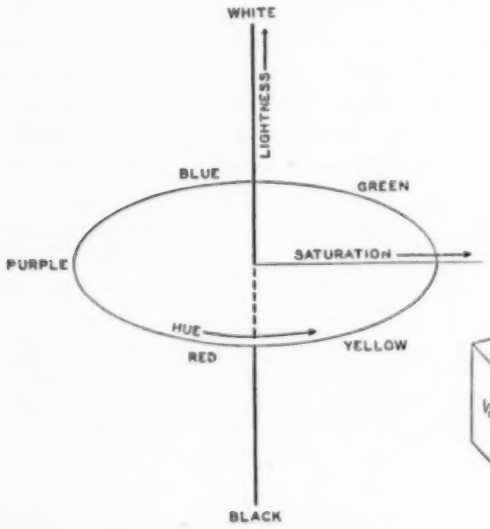

Fig. 1.—Dimensions of the color solid.

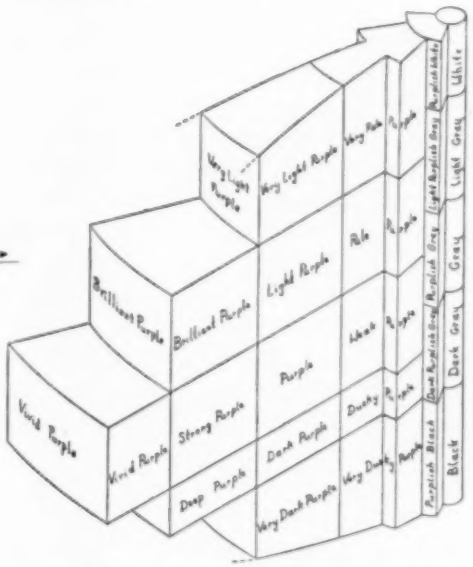

Fig. 2.—A portion of the color solid including purples, grays, black and white. This figure shows 24 of the 320 compartments, 19 being for purples, 5 for achromatic colors.

color solid has been divided into 320 approximately equal compartments and each compartment assigned a name. Figure 2 shows 24 of these compartments. All colors represented in each compartment are to be known by the same name. Since we have to deal with about ten million different object colors, it will readily be seen that not all colors will have a separate name; in fact, on the average there will be about twenty thousand colors to a single name. The most convenient number of names for describing the colors of drugs and pharmaceuticals seems, however, to be about 300. This system of color names is being applied to actual

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drugs and pharmaceuticals in the Colorimetry Section of the National Bureau of Standards under a research associateship set-up by the AMERICAN PHARMACEUTICAL ASSOCIATION.

E. N. Gathercoal is in charge of the project while the experimental work is carried out by us at the National Bureau of Standards. The work carried on is of two kinds: the colorimetry of drugs and pharmaceuticals, and the adjustment of the boundaries of the compartments to accord with the color names. At present the boundaries of the compartments are expressed in terms of the Munsell color

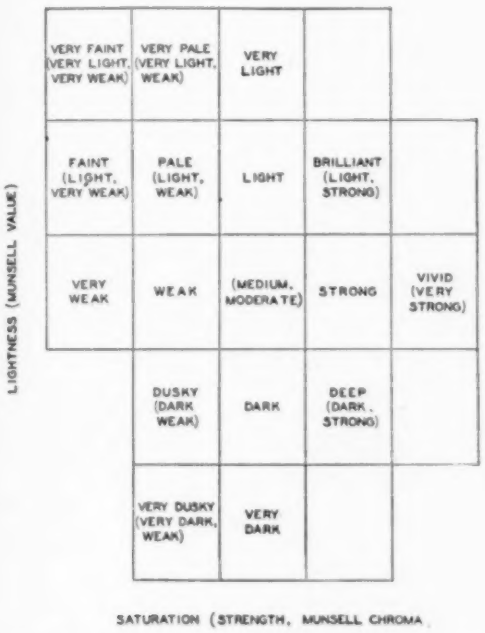

Fig. 3.—Inter-Society Color Council system of modifiers and their abbreviations.

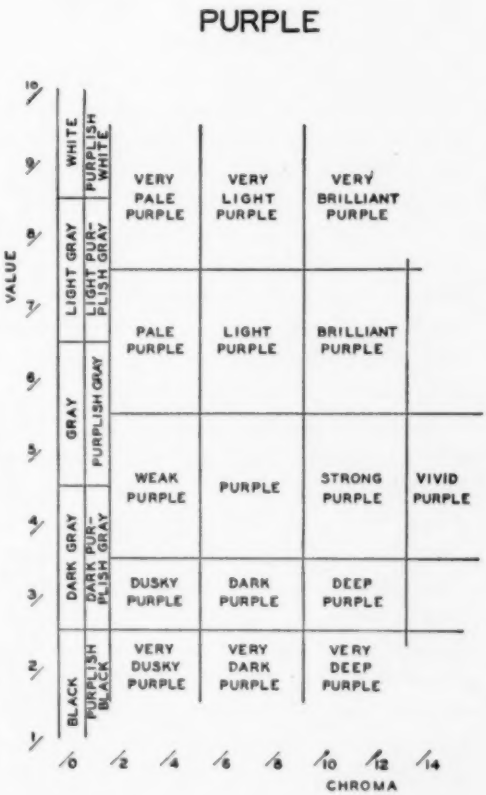

Fig. 4.—A typical chart.

systems; so the colorimetry of drugs and pharmaceuticals has consisted chiefly of comparison with the Munsell samples. This system is arranged according to the color solid and forms a very convenient way of defining the boundaries of the various compartments. Two sets of the master standards of the Munsell color system have been deposited with the National Bureau of Standards, and eventually all of the boundaries and all of the colorimetric results will be expressed in fundamental terms through spectrophotometric measurements of the master standards. Much of this spectrophotometric work has been done.

Standard methods for preparing samples of crude drugs for examination both in whole form, and in powdered form, have been worked out; and the visual com-

parison with the Munsell standards has been carried out independently by both of us. When a sample was found to have a color so near a boundary that it was not certain which name should be given to it, the comparison was usually carried out again by using a disk colorimeter. In this colorimeter, the observer sees a divided photometric field, one-half of which is filled with light reflected from the sample and the other with light reflected from a disk made up of four sectors, each sector being a Munsell standard. Comparisons made in this way are more precise because the line separating the colors to be compared is very narrow in the photometric field and because the observer adjusts the angular size of the sectors until a perfect match is obtained. This is in contrast to the less precise method of direct visual comparison with the Munsell samples in which a perfect match is rarely found, the observer in general having to estimate the notation of the sample color by visual interpolation between neighboring Munsell samples. This colorimetric work has occupied the major part of the time. The work on powdered drugs has been finished except that which refers to microscopic structures; and a good start has been made on whole crude drugs.

A considerable amount of time has been spent on the arbitrary adjustment of boundaries between compartments to make the names fit the colors. To give an idea of what sort of consideration is involved, it will be necessary to tell more about the Inter-Society Color Council system of names on which the work has been based. In general, the color name consists of a noun indicating the hue (such as green, red, blue or purple) combined with one or more adjectives to indicate what kind of a blue or purple the color is. Thus, the adjective will tell whether it is a light or dark purple, a strong or weak one. If it were both light and strong, the combination "light, strong" would be thought of; but this has been shortened to the single adjective, brilliant. Similarly, the combination "dark, strong" has been shortened to the adjective, deep. Figure 3 shows all of the abbreviated modifiers. The adjectives, very weak, faint and very faint, are used only for orange and yellow-orange. Note how it is possible to tell the nature of a color difference directly from the adjectives, and also that if it is necessary from a legal standpoint to know whether a substance is dusky purple or weak purple, the boundary is definite and will be completely specified beforehand. Figure 4 shows the present boundaries for purple in terms of Munsell value and chroma. This is a vertical section through the center of the solid shown in Fig. 2. It is typical of the application of the modifiers to colors of one hue, except that for red, orange and yellow a more complicated system is required to permit the introduction of the hue names, brown and olive, which refer to dark colors. Note that the very weak purples are not identified as purples, but rather as purplish white, purplish gray or purplish black; this is the typical method.

All of the boundaries between the names of the same hue and between the different hues have been adjusted to accord with our ideas of what is appropriate. This system of boundaries has been put through more than twenty revisions as our ideas of the appropriate names have become more crystallized. In making these twenty revisions account has been taken of fifty or sixty suggestions from many sources and nearly all of the suggestions resulted in improvement. Only a few suggestions have been contradictory so that it was necessary to choose between them. The time is now approaching when it will be necessary to make the final

adoption of boundaries, and we have increasing confidence that further chance for definite improvement of the names by adjustment of the boundaries is slight. It is hoped, however, to enlist the aid of those who are interested in the color names used in the description of drugs and pharmaceuticals to give the present tentative systems of boundaries a final check before adopting it.

A summary of the work on powdered crude drugs has been prepared. This summary gives for each powdered drug the color name now included in the National Formulary monograph, then it gives the color name or names found from the present tentative system together with the number of samples examined. Copies of this summary are available now to all who wish them.[1] Criticism is invited of the color names yielded by the present system. If, for example, you believe from your knowledge of drugs that the term, weak Olive-Green, would be a more accurate description of Adonis than pale Olive-Brown, we hope that you will so inform us. New color names cannot be added to the system, but the boundaries can be adjusted so that another of the listed names could be applied to a given drug. Our judgment as to appropriate names has been based a good deal on the present names to be found in the National Formulary. The aim is to make available a system of color names having legal and scientific standing and, at the same time, a system which will accord with present usage of color names as much as possible. Criticisms will help to do this. They should be submitted either to the AMERICAN PHARMACEUTICAL ASSOCIATION or to the National Bureau of Standards where they will receive our interested attention.

DRUG EXTRACTION. XVII. MODIFIED REPETITION DIACOLATION.*[1]

BY WILLIAM J. HUSA[2] AND C. L. HUYCK.

Using powdered belladonna root, experiments have been conducted to determine the efficiency of a modified repetition diacolation process as compared with the U. S. P. XI percolation and fractional percolation processes for making fluidextracts.

HISTORICAL REVIEW.

Introduction of Repetition Diacolation.—In 1930, H. Breddin (1) of Germany described a repercolation process which he called "repetition diacolation." He reported that by this method he obtained 300 Gm. of fluidextract from 300 Gm. of menstruum and 300 Gm. of drug. Glass tubes about one-half meter in length and 3.3 cm. in width were employed as percolators. To conserve alcohol, water was used in each tube toward the end of the percolation to displace the menstruum held by the marc. The 300 Gm. of drug were divided into three 100-Gm. portions. The first portion of drug was extracted with 200 Gm. of menstruum, the first 50 Gm. of percolate being reserved. The next 150 Gm. of percolate and 50 Gm. of

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[1] This paper is based on part of a dissertation presented to the Graduate Council of the University of Florida by C. L. Huyck, in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

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fresh menstruum were used to extract the second portion of drug, the first 50 Gm. of percolate again being reserved. The next 150 Gm. of percolate and 50 Gm. of fresh menstruum were used to extract the third portion of drug, a reserve percolate of 200 Gm. being collected. The reserves were united to make 300 Gm. of finished fluidextract.

Advantages of Repetition Diacolation.—The advantages of repetition diacolation over simple percolation were stated by Breddin (2) as follows: (*a*) economy of menstruum, (*b*) avoidance of distillation and (*c*) prevention of formation of capillary passages in the packed drug by use of cylindrical tubes as percolators. Breddin (3) also made other claims of superiority of cylindrical tubes over conical percolators. It was stated (4), (5) that by the avoidance of heat, repetition diacolation produced fluidextracts having a better odor and taste than those made by simple percolation. Breddin (6) reported that in the preparation of tinctures, repetition diacolation had an advantage over maceration in eliminating the use of a metallic tincture press, which caused contamination with tannin-bearing drugs.

Disadvantages of Repetition Diacolation.—According to H. Ihbe (7) the disadvantages of Breddin's process were found to be as follows: (*a*) full extraction was not attained in the last tube, (*b*) close observation was needed in collecting the weak percolate, (*c*) difficulty was encountered in estimating the volume of the moistened drug for the selection of tubes of the proper size.

Drugs upon Which Repetition Diacolation Was Tested and Results Obtained.—Breddin (8), (9) reported that repetition diacolation was successful in the extraction of ergot, condurango, orange peel, valerian, male fern, sabadilla, cinchona, cinnamon, digitalis and cantharides. Rademacher (10) made fluidextract of thyme by this process and stated that, on the basis of active constituents present, it clearly surpassed the fluidextract made according to the German Pharmacopœia. Gstirner (11) reported that fluidextract of ipecac made by repetition diacolation was superior in content of alkaloids and extractive matter to fluidextracts made by the pharmacopœial processes of Germany, Switzerland, Denmark, Sweden, Great Britain and the United States. It was stated by Madsen (12) that in the case of thyme, valerian and senega the fluidextracts made by repetition diacolation contained more extractive matter than those made by either simple percolation or repercolation. Brandrup (13) found that repetition diacolation produced a slightly better fluidextract of thyme than simple percolation. It was reported by Reinicke (14) that fluidextract of senega made by repetition diacolation was superior to fluidextracts made according to the pharmacopœias of Switzerland and the United States.

Variations of Repetition Diacolation.—A modification of repetition diacolation was described by Ihbe (7). In his procedure 600 Gm. of drug were divided into three equal portions. The first two tubes were provided with stop-cocks and all three were arranged so that the percolate would flow by gravity from one to the other. The first portion of drug was moistened with 45 Gm. of menstruum, the second with 67 Gm. and the third with 88 Gm. From the three portions of drug the quantities of reserve percolate collected were 45 Gm., 67 Gm. and 488 Gm., respectively. The reserves were mixed to make a total of 600 Gm. of fluidextract from 600 Gm. of drug. Ihbe stated that a one per cent solution of sodium chloride and mixtures of various organic solvents, such as acetone, chloroform and benzin,

when adjusted to the same specific gravity as that of the menstruum, were suitable for displacing the menstruum from the marc. Fluidextracts of ergot, senna and bitter orange were made by this process by Ihbe (7).

Breddin varied his process at times in different ways. In some cases he used four or five tubes, and sometimes he mixed the drug with kaolin or finely clipped cotton. Denatured alcohol and benzene colored red with a dye were used to displace the menstruum in some cases (15).

In the preparation of fluidextract of thyme, Rademacher (10) evacuated the receiver when the flow was not sufficiently rapid.

EXPERIMENTAL PART.

Preparation of Fluidextract of Belladonna Root by a Modified Repetition Diacolation Process.—In applying the repetition diacolation process to belladonna root in the present study, certain modifications were made. From previous results of the present authors (16) it was obvious that sufficient menstruum was not used in repetition diacolation to thoroughly exhaust belladonna root. For this reason the process was modified by collecting twice as much weak percolate as was recommended by Breddin. Furthermore, the menstruum remaining in the drug near the end of the percolation of each portion of drug was not displaced by water as was done by Breddin.

As directed in repetition diacolation, heavy-walled glass tubes were used as percolators, the dimension being as follows: length, 65 cm.; thickness of wall, 5 mm.; internal diameter, 4.1 cm. The lower end of each tube was fitted with a one-holed rubber stopper which was channelled so as to allow suitable drainage. The flow was regulated by use of a screw clamp.

The drug used was moderately coarsely powdered belladonna root from a 100-lb. portion previously described (16). The menstruum was a mixture of four volumes of alcohol and one volume of distilled water. The procedure, which was carried out in duplicate, was as follows. A 750-Gm. portion of drug was divided into three equal portions. The first 250-Gm. portion of drug was moistened with 62.5 cc. of menstruum, transferred to a percolator tube and allowed to stand for about fifteen minutes. The drug was then packed from the top, saturated with menstruum and allowed to macerate for about two days. Percolation was then allowed to proceed, a reserve percolate of 125 cc. and five successive 150-cc. portions of weak percolate being collected. The second portion of drug was treated in the same manner, with the exception that the various fractions of weak percolate in the order of collection were used as menstruum, followed by sufficient fresh menstruum to allow collection of 125 cc. of reserve and five 150-cc. fractions of weak percolate. The third portion of drug was then percolated with weak percolate from the second portion of drug and a reserve percolate of 500 cc. was collected. The three reserve portions of percolate were then mixed to yield 750 cc. of fluidextract from 750 Gm. of drug.

In each case the volume of the packed drug was about 650 cc. and the height of the drug column was about 47.5 cm. When menstruum was poured on the first portion of packed drug the liquid reached the lower orifice in about $7^1/_2$ hours, while in case of the second and third portions of drug 16 to 18 hours were required for the liquid to reach the lower orifice. The greater length of time required for the menstruum to flow through the drug in the latter portions is doubtless due to the greater viscosity of the weak percolate used as menstruum as compared with fresh menstruum used for the first portion; the same phenomenon was observed in other fractional percolation processes previously reported. The rate of flow of percolate was about 1.2 to 1.4 cc. per minute. Analytical data are given in Table I.

TABLE I.—ANALYTICAL DATA ON FLUIDEXTRACTS OF BELLADONNA ROOT PREPARED BY MODIFIED REPETITION DIACOLATION.

	Gm. Alkaloids in Percolates.		Gm. Total Extractive in Percolates.	
	Exp. A.	Exp. B.	Exp. A.	Exp. B.
First reserve 125 cc.	1.4	1.4	21.6	19.4
Second reserve 125 cc.	1.5	1.4	25.2	24.4
Third reserve 500 cc.	1.7	2.1	65.9	72.4
Total 750 cc.	4.6	4.9	112.7	116.2
Total calculated on 1000 cc.	6.1	6.5	150.3	154.9

In previous work (16) fluidextracts of belladonna root made from the same shipment of drug used in the present study contained 5.8 Gm. of alkaloids per L. when made by U. S. P. percolation and 5.7 Gm. of alkaloids when made by U. S. P. fractional percolation. Since the average content of alkaloids in the fluidextracts made by modified repetition diacolation was 6.3 Gm. per L., it is apparent that this process is more efficient for the extraction of the alkaloids of belladonna root than the U. S. P. XI processes.

Modified Repetition Diacolation with Oldberg Percolators.—In comparing repetition diacolation with U. S. P. fractional percolation it is seen that there are two main points of difference: (*a*) the type of percolator used, and (*b*) the relative quantities of drug in the various portions. Accordingly an experiment was carried out using the same proportions of drug and the same scheme of collection of percolates as in modified repetition diacolation, but using Oldberg percolators in place of cylindrical glass tubes. This experiment was intended to show whether the more favorable results obtained in modified repetition diacolation were due to the apparatus or to the proportions of drug and percolates.

Since the percolators, when two-thirds full, were found to hold more drug than the tubes, portions of 333.3 Gm. of drug were used instead of the 250-Gm. portions employed in the previous experiment. The method used was the same as in the preceding experiment.

The entire process was conducted in duplicate. The volume of packed drug was 800 cc. and the height of the drug column was 20.5 cm. The liquid reached the lower orifice in about 1¼ hours in the first portion and in about 6 to 7 hours in the second and third portions. The rate of flow was about 1.2 to 1.6 cc. per minute. Analytical data are given in Table II.

TABLE II.—ANALYTICAL DATA ON FLUIDEXTRACTS OF BELLADONNA ROOT PREPARED BY MODIFIED REPETITION DIACOLATION USING OLDBERG PERCOLATORS.

	Gm. Alkaloids in Percolates.		Gm. Total Extractive in Percolates	
	Exp. C.	Exp. D.	Exp. C.	Exp. D.
First reserve 167 cc.	1.7	1.7	23.7	21.3
Second reserve 167 cc.	1.9	1.8	25.7	26.1
Third reserve 666 cc.	2.5	2.6	99.7	99.7
Total 1000 cc.	6.1	6.1	149.1	147.1

In order to obtain a better comparison of the results of Tables I and II, the results of Table I were recalculated on a basis of 1000 cc. of fluidextract and averages were taken of the duplicate experiments. The comparative results are given in Table III.

TABLE III.—COMPARISON OF CYLINDRICAL TUBES AND OLDBERG PERCOLATORS IN MODIFIED REPETITION DIACOLATION.

	Gm. Alkaloids in Percolates.		Gm. Total Extractive in Percolates.	
	Cylindrical Tubes.	Oldberg Percolators.	Cylindrical Tubes.	Oldberg Percolators.
First reserve 167 cc.	1.9	1.7	27.4	22.5
Second reserve 167 cc.	1.9	1.9	33.2	25.9
Third reserve 666 cc.	2.5	2.5	92.0	99.7
Total 1000 cc.	6.3	6.1	152.6	148.1

From the results in Table III, it appears that there is a slight advantage in favor of cylindrical tubes. The total extractive was removed from the drug somewhat more rapidly in the tubes. The alkaloids were apparently extracted slightly more efficiently in the tubes although the difference was scarcely beyond the experimental error.

The fluidextracts made in Oldberg percolators by modified repetition diacolation contained 6.1-Gm. alkaloids per L. as compared with 5.7 Gm. per L. for fluidextracts made from the same shipment of drug by U. S. P. fractional percolation. Hence it appeared that the proportions of drug and percolates used in modified repetition diacolation were superior to those specified in U. S. P. XI fractional percolation. However, it seemed desirable to carry out a further experiment in order to eliminate all possible sources of error. In order to equalize such factors as temperature, etc., a portion of fluidextract was made by each of the processes at the same time in the same room. The drug used was taken from the large shipment and again thoroughly

mixed. The U. S. P. XI fractional percolation process and the modified repetition diacolation process as previously described were followed, using Oldberg percolators throughout. Experimental details and analytical data are given in Tables IV and V.

TABLE IV.—DIRECT COMPARISON OF MODIFIED REPETITION DIACOLATION AND U. S. P. FRACTIONAL PERCOLATION.

	U. S. P. Fractional Percolation.			Modified Repetition Diacolation.		
	First Portion.	Second Portion.	Third Portion.	First Portion.	Second Portion.	Third Portion.
Weight of portion of drug in Gm.	500.0	300.0	200	333.3	333.3	333.3
Volume of packed drug in cc.	1250.0	745.0	485	820.0	820.0	820.0
Height of drug column in cm.	27.5	19.5	19	23.0	23.5	22.5
Time required for liquid to reach lower orifice, in minutes	135.0	150.0	115	112.0	192	255.0
Rate of flow in cc. per minute	1.5	1.6	0.9	1.6	1.6	1.6

TABLE V.—ASSAY RESULTS ON FLUIDEXTRACTS OF BELLADONNA ROOT.

	Gm. Alkaloids in 1000 Cc.	Gm. Total Extractive in 1000 Cc.
Modified repetition diacolation	6.4	149.5
U. S. P. XI Fractional Percolation	5.9	148.5

The results on alkaloidal content of the fluidextracts in Table V confirm the conclusion that the proportions of drug and percolates used in modified repetition diacolation are superior to those specified for fractional percolation in the U. S. P. XI and N. F. VI.

DISCUSSION OF RESULTS.

Our results showing the superiority of modified repetition diacolation over Processes A and C of the U. S. P. and N. F. in the preparation of fluidextract of belladonna root are in agreement with the results of other workers on ipecac, senega, thyme and valerian (1), (12), (13), (14).

Modified repetition diacolation is a simpler process than fractional percolation of the U. S. P. and N. F. in that the drug is divided into three equal portions and the same quantities of reserve and weak percolate are collected from the first two portions of drug. When Oldberg percolators are used in both processes the convenience of operation and the time consumed are practically the same.

Since the terms "repercolation," "fractional percolation" and "divided percolation" have already been used for many years to designate percolation processes in which the drug is divided into several portions, there appears to be no necessity for the introduction of the new term "repetition diacolation." There appears to be nothing in the process of repetition diacolation of Breddin that has not been used before by others. The idea of dividing the drug into equal portions in repercolation is not new since it was used during the past fifty years by a number of workers including C. S. N. Hallberg (17), R. A. Cripps (18), F. Musset (19), D. C. Kelly (20), and J. V. Catford (21); it was also included in the British Pharmacopœia of 1914.

The use of cylindrical tubes as percolators is by no means an innovation. As far back as in 1862, Lalieu (22) conducted a repercolation process using a series of cast-iron tubes of about the same dimensions as the tubes used in repetition diacolation. Glass tubes have been used by various workers, including J. U. Lloyd (23) and J. V. Catford (21). Displacement of an alcoholic menstruum by water is not new; for example, it was used many years ago by E. R. Squibb (24).

In spite of the lack of any new features in Breddin's repetition diacolation process, it is worthy of attention from the standpoint that division of the drug into three equal portions is simpler and better than the division into three unequal portions as specified in U. S. P. fractional percolation. Apparently in modified repetition diacolation the proportion of reserve percolate to quantity of drug in the first two portions is advantageous.

On the whole, the use of cylindrical glass tubes in place of Oldberg percolators is not advantageous, particularly if one considers that the Oldberg percolators are easier to pack and clean. In the present study of modified repetition diacolation, two fluidextracts of belladonna root made in glass tubes averaged 6.3 Gm. of alkaloids per L. while four fluidextracts made in Oldberg percolators averaged 6.2 Gm. of alkaloids per L. These results are in accord with the conclusion reached by the present authors in a previous investigation (25) in which it was found that in ordinary percolation there was no appreciable advantage for either glass tubes or Oldberg percolators from the standpoint of efficiency of extraction of alkaloids.

The displacement of the alcoholic menstruum from the marc by water was not carried out in the present study because many investigations, including the recent work of Büchi and Feinstein (26) have shown that this is not successful for numerous drugs. Naturally there would always be some mixing of the two liquids and a sharp separation could not be expected. However, on the plan used in some European pharmacopœias of preparing 1000 Gm. of fluidextract from 1000 Gm. of drug there would not be such a great necessity of a sharp separation of the alcoholic liquid and the water used for displacement, because in preparing 1000 Gm. of fluidextract from 1000 Gm. of menstruum and 1000 Gm. of drug a quantity of menstruum is left in the drug equal to the weight of the total extractive matter in the finished fluidextract. While displacement is thus theoretically possible it is not always practical because water causes the marc of some drugs to swell and clog the percolator.

SUMMARY.

The proportions of drug and percolates used in modified repetition diacolation are superior to those specified for fractional percolation in the U. S. P. XI and N. F. VI. Modified repetition diacolation is simpler than fractional percolation in that the drug is divided into three equal portions and the same quantities of reserve and weak percolate are collected from the first two portions of drug.

The superiority of modified repetition diacolation over Processes A and C of the U. S. P. in the preparation of fluidextract of belladonna root as demonstrated in the present study is in agreement with the result of other workers on ipecac, senega, thyme and valerian.

The use of cylindrical glass tubes in modified repetition diacolation has no appreciable advantage over the use of Oldberg percolators.

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A PHYTOCHEMICAL AND PHARMACOLOGICAL STUDY OF SOLANUM VILLOSUM.*,[1]

BY EARL PETER GUTH.[2]

CHAPTER I.

INTRODUCTION.

The family *Solanaceæ* comprises about 75 genera and 1750 species (1), the majority of which contain either alkaloids or glucosides. Among this large number are two, *viz.*, *Solanum nigrum* L. and *Solanum villosum* Mill., that attracted attention because of conflicting reports relative to the poisonous effects on domestic animals when mixed with feed or when eaten while the animals were grazing. These two species are found growing as "weeds" in Washington fields and gardens.

According to Wehmer (2), *Solanum nigrum* contains the "Alkaloidal-Glucoside" solanine and traces of a not so well-defined mydriatic alkaloid. Schutte (3) reports finding an unidentified mydriatic alkaloid.

Pammel (4) reports a case of poisoning of a sheep by *Solanum nigrum* and concludes that the leaves were poisonous. The fruit he states is used in making jam and has little toxicity. At a later date (5) Pammel reports that the ripe fruit of *Solanum nigrum* is not poisonous but that the green or unripe fruit is toxic.

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[1] An abstract of a thesis presented as a partial requirement for the degree of Doctor of Philosophy, College of Pharmacy. This Phytochemical work was supervised by Dr. H A. Langenhan, Professor of Pharmacy.

[2] University of Washington, 1937.

A later report (6) states that nine ducks and six chickens died as a result of eating the fruit of *Solanum nigrum*. The same year Pammel (7) states that *Solanum nigrum* has been listed as a poisonous plant; that the ripe berries are probably not poisonous. In contradiction in part to the above reports, Stevens (8) states that *Solanum nigrum* does not seem to be poisonous to man or sheep.

Whereas no definite information was found in the available literature relative to the constituents of *Solanum villosum*, Wehmer (9) states that this specie is probably similar in composition as *Solanum nigrum* and locally the report prevails that *Solanum villosum* is poisonous to domestic animals, it was decided to attempt a phyto-chemical analysis and a pharmacological determination of the several parts of the plant.

Solanum villosum is an annual plant growing abundantly in cultivated fields in the Northwest. The plant is low, freely branching from the base, 30 to 60 cm. high, leaves ovate to broadly lanceolate, the blade 2 to 5 cm. long, coarsely sinuate-toothed, narrowed below to a more or less winged slender peticle; peduncles lateral 3–8 flowered, 3 to 6 cm. long; flowers white on pedicles 3–10 mm. long; calyx-lobes triangular-ovate half as long as the corolla; enlarging at length and embracing the fruit; corolla 4 to 10 mm. in diameter, the merely spreading lobes acute; filaments glabrous to the base; anthers oblong obtuse; berries globular, 4 to 8 mm. in diameter, yellow when ripe (10). The *Solanum villosum* growing in the Northwest, however, has green berries. This same species has been reported to grow in the vicinity of Philadelphia where it is supposed to have its origin in this country, it being transported in ballast from Europe. This plant grows most abundantly in loamy soils that have been heavily fertilized and where it is not too often disturbed by cultivation such as in tomato and in pea fields. The plant has become a very objectionable "weed" in that the green berries become mixed with the shelled peas causing them to be unfit for commerce and also that the plant becomes mixed with the pea vines, which are used as food for domestic animals.

Because the two species, *viz.*, *Solanum villosum*, Mill. and *Solanum nigrum* L. are very similar in physical appearance, a comprehensive description of both plants is inserted to enable those who may be interested to easily distinguish one plant from another.

Solanum villosum, Mill.	*Solanum nigrum*, L.
Stem.	**Stem.**
More or less villous	Glabrous or nearly so
Freely branching from the base	Freely branching
30 to 60 cm. high	30 to 60 cm. high
Root.	**Root.**
Annual	Annual, usually larger than *Solanum villosum*
Leaves.	**Leaves.**
Villous	Glabrous or nearly so
Ovate to broadly lanceolate	Ovate petioled
2 to 5 cm. long	2 to 8 cm. long
Coarsely sinuate-toothed	Entire repand or sinuate-toothed
Narrowed below to a more or less winged	Acutish to acuminate at the apex
Slender petiole	Cunate to rounded at the base
Flowers.	**Flowers.**
White	Pedicles 5 to 12 mm. long
Pedicles 4 to 12 mm. long	Calyx-lobes ovate or oblong-ovate, obtuse
Calyx-lobes triangular, acute	Corolla 6 to 10 mm. in diameter, the spreading or reflexed lobes acute
Corolla 6 to 10 mm. in diameter the merely spreading lobes acute	Filaments pilose
Filaments glabrous	Anther oblong, obtuse, loosely connivent
Anther oblong obtuse	

Berries. Berries.

Yellowish green when ripe Black when ripe

CHAPTER II.

EXPERIMENTAL.

Forty pounds of fresh *Solanum villosum* were collected in October 1935, from a bulb farm near Seattle. The plants were fully matured. A few blossoms were still on some of the plants but most of them were abundant in berries.

The forty pounds were dried in a hot air drier at 90° C. The dried plants weighed five and one-half pounds indicating a loss of water content of 86–87 per cent.

The plants were then separated into their four major parts, *viz.*, berries, leaves, stem and root. The amount of each and the percentage of plant they constitute is tabulated below:

	Grams.	Per Cent.
Stem	715	30.6
Root	106	4.5
Leaves	785	33.6
Berries	730	31.3

Because the berries, leaves and stem comprised over 95 per cent of the plant and were the parts that were of immediate importance it was decided to investigate these only.

Ash.—The three parts of the plant were each assayed for ash and mineral content. The methods used were those described in the "Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists."

The following tabulation contains the result of the analysis and shows a very interesting distribution of the common plant mineral constituents.

	Berries. Per Cent.	Leaves. Per Cent.	Stem. Per Cent.
Total ash	9.49	26.84	15.81
Silica and sand	11.22	58.59	10.46
Fe_2O_3	1.20	1.33	1.07
Al_2O_3	2.27	6.22	1.65
CaO	3.13	8.94	7.83
MgO	2.89	2.68	1.88
Cl_2	1.55	0.87	2.80
SO_4	7.66	4.09	6.76
N	2.86	3.45	1.44
KCl, NaCl	51.40	20.10	58.10
P_2O_5	6.75	3.85	0.60

Extraction with Selective Solvents.—A process of selective extraction was carried out on each of the three parts of *Solanum villosum*, using ten-Gm. samples. The extraction was carried out with a Soxhlet apparatus using petroleum ether, ether, chloroform and alcohol as solvents and for a period of eighteen hours each. The extracts were allowed to evaporate spontaneously and dried in a desiccator over calcium chloride and weighed.

This experiment revealed the presence of a fixed oil in the berries, faintly positive tests for alkaloids in the leaves and a mixture of inorganic salts in the leaves.

Each extractive was examined carefully for crystalline substances and tested for alkaloids by the conventional methods of alkaloidal assay.

The following tabulation offers a comparison of the various amounts of extractive obtained from each part of the plant.

Solvent.	Berries. Per Cent.	Leaves. Per Cent.	Stem. Per Cent.
Petroleum ether	9.23	1.6	0.72
Ether	2.45	1.82	1.26
Chloroform	3.23	1.25	0.04
Alcohol	23.26	11.80	1.08

Moisture and Volatile Constituents of Plant.—The three parts of the plant were dried at 100° C. to determine moisture content and volatile constituents and again at 105° C.

	Per Cent Lost at 100° C.	Per Cent Lost at 105° C.
Berries	6.6	6.9
Leaves	8.3	8.3
Stem	7.3	7.4

Fixed Oil of Solanum villosum (Berries).—In the first petroleum-ether extraction of the berries it was noted that a fixed oil was present. Two hundred and fifty grams of powdered dried berries were percolated with ether and 24 Gm. of oil were obtained. This oil was a dark green due to the chlorophyll. An attempt was made to remove the chlorophyll by using various solvents and mixtures of solvents but was unsuccessful. The oil was then assayed for its general characteristics. All methods used were those outlined in the "Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists."

Odor—plant or hay-like
Taste—bland
Color—dark green
Solubility—miscible with petroleum ether, chloroform, acetone, carbon tetrachloride, methyl alcohol and ethyl alcohol.

Density	0.8861	25° C.
Refractive index	1.4818	25° C.
Saponification number	192.15	
Reichert Meisel Number	1.6711	
Iodine number	126.00	
Polensky number	0.3763	

Tannins.—Each of the three parts of the plant, *viz.*, berries, leaves and stems were assayed for tannins as directed in the "Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists" for tannin in tea.

The concentrated extracts from large quantities of the plant gave a qualitative test for bloom tannin.

On assay, however, comparatively small amounts of tannin were found. The berries contained the most with 0.95 per cent, the leaves and stem only traces.

Carbohydrate Analysis.—The plant was assayed for reducing sugars, non-reducing sugars and starch by the method indicated in the "Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists" for plants using the gravimetric determination and hydrochloric acid for hydrolysis. Ten-gram samples were used for sugars and 4–5-Gm. samples for starch. The reducing sugars were calculated to dextrose and the non-reducing sugars to sucrose. Pentosans were assayed for by the method described in the "Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists."

	Per Cent of Dextrose.	Per Cent of Sucrose.	Per Cent of Starch.	Per Cent of Pentosan.
Berries	3.65	6.60	7.75	5.96
Leaves	1.90	0.00	10.1	5.92
Stem	1.90	5.90	13.2	8.60

Glucosides.—One hundred grams of berries were extracted with boiling water made alkaline with $CaCO_3$. The extract was filtered while hot and treated with neutral lead acetate to precipitate the plant extractive. The excess lead was removed with Na_3PO_4 and filtered. The filtrate was washed with chloroform. The chloroform washings were dried over anhydrous sodium sulfate, filtered and evaporated (11). The slight residue obtained was of a gummy nature with a very decided aromatic odor. This residue was treated with 10 per cent HCl. The acid solution was stratified with alcoholic solution of phloroglucinol. A red zone formed at the junction. This red zone formation and aromatic odor might be due to the presence of vanillin (12).

Preparation of Solanine.—Some solanine (?) was prepared from potato sprouts by the following method: Fresh young potato sprouts were finely ground and macerated for 24 hours with

a two per cent acetic acid solution. The liquid was strained and the pulp expressed to obtain the maximum amount of extractive. To this strained liquid ammonia was added until distinctly alkaline. The precipitate formed was filtered off and treated with boiling 95 per cent alcohol. On cooling beautiful long white needles separated from the alcoholic solution. These needles after drying in a desiccator had a m. p. of 240 ° C. On further purification the m. p. was 249° C. Pure solanine is difficult to obtain inasmuch as it decomposes into solanidine and a mixture of sugars including dextrose, rhamnose and galactose. Also various imperical formulæ have been assigned to solanine, all having different melting points.

(Firbas) $C_{52}H_{93}O_{4.5}H_2O$ m. p. 250° C. (13)
(Cazeneuve & Breteau) $C_{28}H_{47}O_{11}N.2H_2O$ m. p. 235° C. (13)
Davis $C_{42}H_{75}O_{12}N$ (13)
Colombano $C_{32}H_{51}O_{11}N$ m. p. 244° C. (13)

It was therefore assumed that the solanine (?) prepared from potato sprouts was pure enough for color test comparisons. The color tests conformed only partially with the color tests given by other workers for solanine.

On testing the solanine for solubility in various solvents it was found to be insoluble in cold alcohol, ether, chloroform and carbon tetrachloride but that a jell was formed if the solanine was warmed with amyl alcohol, amyl acetate and benzol. These jells were very permanent as they did not break or change on standing for several months. Twenty milligrams of solanine made a very stiff jell with 5 cc. of solvent. This phenomenon was later noticed in the jelling of benzol by an unidentified compound extracted from the berries of *Solanum villosum*.

Examination of Young Plants for Solanine.—It was thought that inasmuch as young potato sprouts contained more solanine than in the mature plant that perhaps solanine may be present in very young plants of *Solanum villosum*. Fifteen hundred grams of small plant were collected in May 1936. These plants were not over 3–4 inches in height and contained no blossoms. They were ground to a pulp while still fresh and immediately treated with a 2 per cent aqueous acetic acid solution. This mixture was allowed to macerate for 24 hours, filtered and the pulp expressed to obtain all the extractive. This extractive was treated with NH_4OH until alkaline and allowed to stand. On standing there was no precipitation. The extractive was then evaporated on a water-bath to dryness and the residue tested for the presence of solanine by taking up in hot alcohol, from which there was no precipitation on cooling. On evaporation of the alcohol solution and treating the residue with acetic acid and sulfuric acid followed with diluted formaldehyde there was no color reaction. It is, therefore, assumed that there is no solanine present in the very young plants.

Extraction of an Active Substance.—Solanine is classified a glucosidal alkaloid because it readily hydrolyzes to give solanodine and sugars. It hydrolyzes more readily with mineral acids, less so with organic acids (14). Therefore believing that the alkaloid most likely to be present in *Solanum villosum* would be solanine the extractions were carried on by means of a 2 per cent acetic acid. Two hundred-gram samples of ground berries were allowed to macerate for 24 hours with 2000 cc. of 2 per cent acetic acid. The liquid was removed by straining through a muslin cloth and the berries finally expressed to obtain the maximum amount of extractive. This acetic extractive was treated with NH_4OH until alkaline. The alkaline solution deposits a heavy magma which was filtered off and allowed to drain. This magma was then treated with boiling 95 per cent alcohol and the alcohol filtered and evaporated on a water-bath. The residue was then taken up with 10 per cent acetic acid and filtered. The filtrate again precipitated with ammonia and the magma collected and digested with hot alcohol (95 per cent). The process was again repeated giving, as final residue, a light amber, varnish-like substance.

This residue was subjected to several color tests for solanine. For comparison the same color tests were run on some solanine prepared from young potato sprouts.

The tests are as follows:

(*a*) When solanine is dissolved in glacial acetic acid, followed by one or two drops of sulfuric acid and then treated with a drop of 1 per cent formaldehyde a deep purple color develops (14).

(*b*) Solanine with nitric acid gives a yellow to orange color (15).

(*c*) Solanine with alcoholic sulfuric acid gives a green tint (15).

(*d*) Solanine with sodium sulfate dissolved in sulfuric acid gives a red color (15).

The following tabulation gives the results of the color tests as run on solanine from potato sprouts, the residue from *Solanum villosum* compared with the colors solanine should give.

Test.	Solanine.	Solanine from Potato Sprouts.	Residue from *Solanum villosum*.
(*a*)	Purple	Purple	Purple
(*b*)	Yellow-red	Yellow-orange	Yellow-orange-yellow
(*c*)	Green tint	Reddish orange	Reddish orange
(*d*)	Red	Deep orange	Deep orange

This tabulation shows a very striking resemblance between the solanine from potato sprouts and the residue obtained from *Solanum villosum* but differs from the colors that solanine is supposed to give, according to the tests referred to.

Numerous experiments were carried out in an attempt to obtain this compound with a crystalline structure and a definite melting point. These experiments became limited due to the fact that only a very small amount of concentrated material was obtained by extraction. This unidentified compound is present in the dried berries in the amount of 0.1 of 1 per cent.

The substance was taken up with hot 95 per cent ethyl alcohol and allowed to evaporate spontaneously and also in vacuum. The residue obtained in both cases was an amber varnish substance with no definite melting point. The melting point varied from 125° to 178° C. depending on the particular extraction. By taking the substance up with hot methyl alcohol and allowing this solution to evaporate a similar amorphous residue was obtained. The residue was then washed with ether to remove any possible fat and after recovering from alcohol it had a melting point of 192° to 195° C. The substance was then taken up with alcohol and a quantity of acetone added. A gelatinous precipitate formed which was filtered off, dried and had a melting point of 205° to 215° C. The alcoholic-acetone solution was then treated with benzol which caused a separation of an amber-colored layer which on evaporation deposited microscopic rosettes, m. p. 215° to 230° C. Each of these fractions gave similar color tests to that of the original residue. This substance emulsified mercury, slowly hemolyzes red blood cells in isotonic solution and foams when shaken with water.

Inorganic Salts from Leaves and Stems.—In the selective extraction experiment under leaves and stems with alcohol as the solvent it was noted that inorganic crystals were formed. These crystals on assay were found to be a mixture of potassium and sodium chlorides and nitrates. From 4600 Gm. of dried stem and leaf 15 Gm. of crystals were obtained. This constitutes 0.32 per cent. Quantitative analysis of crystals.

	Per Cent.		Per Cent.
Chlorides	21.5	Potassium	23.00
Nitrates	41.55	Sodium	20.00

The nitrates were assayed for taking 0.4507 Gm. of crystals and heating them on a water-bath with 10 cc. of hydrochloric acid until dry. Ten cubic centimeters of hydrochloric acid were again added and heated until an aqueous solution of the crystals was neutral to litmus. This converted all the nitrates to chlorides. The total chlorides were assayed for by the Volhard Method. The difference between the original chlorides present and those formed by treatment with hydrochloric acid was computed to nitrates. An approximate assay of potassium was run by precipitating the potassium by adding tartaric acid and igniting to obtain potassium carbonate. Sodium was taken by difference.

PHARMACOLOGY.[1]

Toxicological studies were made on extracts of the leaf, stem and berries by administering the extracts to rabbits by stomach tube. An extract of the stems equivalent to 400 Gm. of the fresh material per Kg. showed no immediate effects but death occurred after nine hours. A dose of the leaf extract equivalent to 400 Gm. of the fresh material per Kg. caused death in one hour and fifteen minutes. A similar dose of the berry extract produced death in one hour and five

[1] This work was supervised by Dr. James M. Dille, Associate Professor, Department of Pharmacology.

minutes. In the last two instances respiratory failure occurred first. Autopsy indicated a great deal of the material unabsorbed. Thus the actual toxic dose is probably less. Indications of gastric and intestinal irritations were observed.

The oil secured from the berry was without effect after a similar administration of 8 cc. per Kg., an amount equivalent to about 400 Gm. of fresh berries.

The toxic dose was determined on rats by injecting 1 mg. of the substance obtained from the berries by chemical methods described by the injection of a graded series of doses beginning at 1 mg. per Kg. and extending to 70 mg. per Kg. All doses were made by intraperitoneal injection. Doses below 10 mg. per Kg. showed no effect. Doses between 10 mg. and 20 mg. per Kg. produced some depression but the animal recovered within a few hours. Higher doses up to 30 mg. showed more pronounced depression and evidence of gastro-intestinal irritation as indicated by diarrhea. A dose of 50 mg. per Kg. produced death in 2 out of 4 rats and with 70 mg. all rats receiving this dose died. Evidence of intestinal irritation was found in each case.

The cause of death was further investigated by means of kymograph records in which the substance obtained from the berries and extract made from the leaf were injected intravenously in rabbits anesthetized with sodium phenobarbital. In each case respiration failed before the heart stopped or the blood pressure fell below critical levels. Artificial respiration was effective in prolonging the animal's life for only about eight minutes after which the blood pressure fell and death occurred.

Since many alkaloids of the solanaceous plants behave like parasympatholytic substances, experiments were made on turtles to test the effect of this substance on the vagus mechanism. Marked paralysis of the vagus occurred from which it was impossible to secure recovery by washing the heart with Ringer's solution. Pilocarpine applied after the substance had no effect but similar administration of atropine produced a marked increase in the rate of the heart. The effect therefore appears to be central to the parasympathetic endings.

DISCUSSION.

At the beginning of this investigation of *Solanum villosum* it was hoped that a definite principle such as an alkaloid or glucoside could be extracted that had toxic properties as the plant was generally believed to be toxic to stock. Repeated attempts to isolate a definite principle from the plant were unsuccessful. However, a substance or compound was isolated that gave promise of being composed at least in part of a toxic principle as indicated in the toxicity experiments. The plant as a whole was also found to be toxic when taken in large amounts. This was proven definitely when rabbits were fed the extract from the stem, leaves and berries in amounts equivalent to 400 Gm. of fresh material per Kg. body weight.

The question as to what causes death has not been completely answered. However, every indication is that the primary cause is a failure of the respiration. In the toxicity experiments it was noted that respiration had ceased long before the heart had stopped beating. This same respiratory failure was found in the administration of the concentrated substance from the berries on rats and rabbits.

This substance obtained from the berries has many of the properties attributed to sapo-toxins. It slowly hemolyzes red blood corpuscles in isotonic solution, emulsifies mercury and foams when shaken with water. Sapo-toxins are also said to paralyze the respiratory center when injected intravenously (16). Sapo-toxins in general are soluble in water and not precipitated by moderate amounts of alcohol but are not soluble in pure alcohol or fat solvents.

The pharmacological action of the substance from the berries closely resembles the pharmacological action of saponins when injected intravenously but the solubility of this product differs greatly in that it is not water soluble and is soluble in pure alcohol and fat solvents.

It must also be pointed out here that the poisonous principle of *Solanum villosum* is probably distributed throughout the plant and is absorbed from the intestinal tract, the latter property placing the compound in the class of saponins (?) that are absorbed, thereby separating it from the large class of unabsorbed saponins.

It is believed that the toxic principle of *Solanum villosum* is probably closely related to solanine and sapo-toxins and that the compound isolated from the berries contains a large share of the toxic principle. This work will be continued in an attempt to definitely establish the identity of the toxic principle. The work done so far points out that caution should be observed by those who are in daily contract with the plant and that the practice of jelly making with the berries and the feeding of live stock with the plant should be discouraged.

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DUTIES OF THE HOSPITAL PHARMACISTS.

T. C. Daniels, states in *Hospitals*, quoted in part, that

"The pharmacist must make certain that all unstable preparations are dated as to their expiration date. There should be a routine check of all products subject to rapid deterioration and where there is evidence of decomposition the product should be discarded and replaced with a fresh supply. The importance of this is sometimes overlooked.

"All medication in the emergency ward should be under the pharmacist's control. An approved antidote list should be available and the medicinals required for such emergency kept in good condition, ready for use. This requires regular inspection.

"Laboratory reagents and stains should logically be under the control of the pharmacist and they require routine inspection to determine if they are in good order.

"The storage and complete control of all biological preparations should be one of the pharmacist's responsibilities. Proper refrigeration facilities must be available for this and products that are "out-dated" should be promptly returned to the manufacturer.

"The pharmacist should be responsible for and at least supervise the preparation and sterilization of all solutions intended for parenteral use. If possible a small room with filtered air should be provided for the purpose. Labels should clearly show the lot number and expiration date of the solution. All injectable solutions should be tested for sterility, pyrogenic properties and where the hydrogen-ion concentration of the solution differs markedly from that of the tissues or environment where it is to be employed it should be buffered at the desired hydrogen-ion level. There are several exceptions to this but in general such a procedure should be adopted. Furthermore unless a hypertonic or hypotonic solution is desired the concentration should be adjusted to make it isotonic."

THE VALUE OF THE PHARMACIST TO THE HOSPITAL.*

BY OLIVER W. YOUNG.[1]

It is probably easy to say what the theoretical value of the pharmacist would be to hospitals in general, but in practice his value at present is dependent upon the hospital. Various types and sizes of hospitals would necessarily require different qualifications. Some hospitals would restrict him entirely to the handling of drugs and galenicals while others would allow him full sway. We may say in general, the smaller the hospital, the more versatile he would need to be, while the larger the hospital, the more routine his work would become. Of course, in the latter case there is the exception of the head pharmacists whose work would naturally be executive in type and who would have to have requirements beyond those of the average graduate pharmacist.

Theoretically, the pharmaceutical graduate from most of our schools of pharmacy should be capable of taking care of or supervising the handling of the following duties if he is to be of real value to most institutions which are large enough to engage the services of a pharmacist. He would be required to take care of outpatient orders and of ward orders. Most of these would be in the form of prescriptions or of special medicines and, of course, he should experience no difficulty in their preparation.

The preparation of almost all solutions would be rightfully his duty, and here some aspects of the work might be a little different from that to which he is accustomed for some are perhaps unique with hospital work. He would be required to prepare sterile solutions varying in quantity from large volumes of saline and glucose solutions down to two or three drams of a sterile eye preparation. Volumetric solutions and the preparation of bacteriological stains might be a little difficult at first, but he should be able to adapt himself to the intricacies of their preparation with little trouble. He would also be called upon to manufacture galenicals in larger quantities than heretofore. Parenteral solutions in ampul form and special extemporaneous solutions such as extracts of house dust and solutions for the injection treatment of hernia would be his problem.

The supervision of the purchasing of drugs and pharmaceuticals would be his and possibly even of hospital supplies. In this matter he could easily save the hospital money, for the intelligent purchasing of drugs and pharmaceuticals with respect to reliable materials, turnover and preservation requires some one who is trained in pharmacy. For the same reason he should supervise the storage of biologicals, drugs and pharmaceuticals and even hospital supplies. He should have rigid control over the narcotics and the emergency supplies such as the various emergency trays, toxicological bag, anesthetics, various stimulants, intravenous solutions, ampuls and antidotes. He may possibly even be given the task of supervising the preparation of surgical dressings. He must have charge of maintaining the ward supplies and act in an advisory capacity in the interpretation of orders left on the floors by the doctors for items which fall within his domain. He should be present at the staff meetings and be prepared to answer questions

* Subsection, Hospital Pharmacy, A. PH. A., New York meeting, 1937.

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concerning his work, be prepared to give information about new drugs such as information concerning dosage, effectiveness and synonymous official medicines if such exist.

Instruction to student nurses in the field of pharmacy and instruction to the interns in prescription writing and in composition would be expected of the hospital pharmacist. He should be prepared to constantly detail the doctors on the official preparations such as the detail men from the various pharmaceutical houses are doing with their own preparations.

All of these duties and possibly a few more which have not been mentioned should come within the jurisdiction of the hospital pharmacist if he is to serve an institution with profit. Unfortunately, however, among all of the hospitals in the country, there are not many whose size will permit the employment of a pharmacist. There are many more, perhaps, who are capable of employing one with profit but who continue to split up such duties among their nurses, technicians and other employees.

Although it is true that much has been accomplished in the past few years through the coöperation of the various hospital associations, the American Medical Association, and the American College of Surgeons, it would be rather too much to expect that these associations should list among their requirements at present the employment of a pharmacist in all of their hospitals. Surely it would be unfair to the small hospital for any one of these associations to require all hospitals to engage the services of a pharmacist and so deprive such small hospitals the benefits attending membership.

The statement has been made, "the greater the demand for the hospital pharmacist, the better qualified the men and women entering this work must be."

It is rather evident that if any real results are to be expected in creating a demand among the smaller hospitals for a pharmacist, an entire reversal of the above statement will be necessary which would then read, the better qualified the men and women entering the field of hospital pharmacy, the greater the demand will be.

The above list of requirements, as numerous as they are, are expected and are taken for granted of the hospital pharmacist, but in order to open the field to a greater degree, it will be necessary to offer even more than this. In the smaller hospitals and in those which are now splitting up his duties among their various employees, it may be possible for a pharmacist to enter hospital service through another branch which may not be strictly in the pharmaceutical field but which would serve as a point of admission.

Once in its employment it would not be so difficult to branch out more into his own line. With the thought in mind that if the graduate had been trained in the field of pure chemistry, physics and bacteriology, rather than trained as he has been in these subjects all with their relation to pharmacy, it might be possible for him to enter hospital work as a technician and afterward expand into his own work. Realizing the value of a man who is not only a pharmacist but who is also qualified to aid the doctor by his ability to do work in the diagnostic laboratory, especially the value of such a man to the small community hospitals, which are rapidly springing up throughout the country, a number of managers of such hospitals in Wisconsin were questioned thus: "Would a pharmacist who has been trained in chemistry,

bacteriology and physics in such a manner that he could also do laboratory work be of any value to a hospital such as yours?"

Every one interrogated was quite enthusiastic. It would seem to the author that men so trained and possessing any business ability at all would make very desirable managers of such hospitals.

Once in close contact with the doctor, such men would easily gain respect by their ability. The answer to this question of gaining recognition among the various associations seems to be to attack the smaller hospital by means of men better suited to their needs rather than by requesting the employment of pharmacists as such. If this can be done, naturally the value of the pharmacist to the hospital would be enhanced.

A MODIFIED 1-2-3 ENEMA.*

BY RAYMOND J. HANSEN.[1]

One of the most common methods in the hospital for emptying the colon is the use of an enema. Its action depends largely upon a stimulation, through distention of the lower bowel, (1) however, in an enema containing a dissolved salt, such as magnesium sulfate or sodium chloride, salt action, or osmosis is also present. The most widely used to-day are the normal saline and the soap suds enemata.

At times a more drastic enema than one of plain tap water or normal saline is desired, and as a result, a solution of magnesium sulfate in glycerin and water is commonly used. This enema consists of 1 oz. of magnesium sulfate, 2 oz. of glycerin and 3 oz. of water and is known as the 1-2-3 enema. The magnesium sulfate is first dissolved in the water and then the glycerin is added. Goldsmith and Dayton (2) developed that the colonic mucosa was impermeable to sulfates, while chlorides and other salts passed through the wall into the blood stream, hence, the use of normal saline enemata in kidney disease is contraindicated, while that containing magnesium sulfate will have no appreciable effect. Consequently, an enema containing magnesium sulfate can be used more often than the plain normal saline enema with less chance of being harmful. H. W. Soper (3) recalls that Meltzer found that solutions of sodium sulfate incited contractions of the colon while solutions of magnesium sulfate produced a relaxation and dilatation. Soper suggests the use of sodium sulfate and recognizes the value of the magnesium sulfate enema in post-operative conditions.

With the recent advance in the price of glycerin, the hospital pharmacist was faced with the problem of keeping the amount of glycerin used at a minimum and it became advantageous to find some substitute for glycerin in these 1-2-3 enemata. Hirschman (4) suggests the use of hydrogen peroxide, one part to two parts of warm water. However, in our experience this has proved as costly as glycerin. In concentrated form we know that glycerin has a dehydrating action and is somewhat of a local irritant, however, in a 50% solution or less, it no longer exhibits this action, but rather becomes an emollient (5). As the concentration of glycerin in the 1-2-3 enema is approximately 40%, the action obtained is probably more as an

* Section on Practical Pharmacy and Dispensing, A. PH. A., New York meeting, 1937.

[1] Hackley Hospital, Muskegon, Mich.

emollient than as an irritant. It was then decided to try as a substitute, a mucilage of tragacanth made by using 1 Gm. of tragacanth to 120 cc. of distilled water. I regret that it was not possible to obtain sufficient cases, however, in the twenty cases on which these enemata were used the results were gratifying.

The cost of preparing this mucilage is based on a quotation from one of our local wholesale-retailers on the price of tragacanth. This price was $2.40 per pound. Since there are 454.6 Gm. to the pound, if we use 450 in our calculations, we shall be safe in our conclusions. At this rate each Gm. will cost approximately $^1/_2$ cent. Remembering that one Gm. is used to make 120 cc. which is twice the amount used in one enema, the cost, then, for the tragacanth is but $^1/_4$ cent per enema. The cost of the distilled water depends largely on whether or not it is manufactured, however, a safe estimate on the cost is 15 cents per gallon. Hence, the cost of the distilled water used in making this mucilage will be about $^1/_4$ cent, thereby bringing the total cost of the mucilage to $^1/_2$ cent. The fluctuation in the price of glycerin makes it somewhat difficult to determine the cost definitely, but if we take 30 cents per pound as an average we find the cost of 2 oz. of glycerin to be $4^1/_2$ cents. In comparison to the cost of the mucilage, it is evident that glycerin is nine times more costly.

Naturally, the problem of preparing the mucilage must be considered. The procedure followed in preparing 1200 cc. of this mucilage is as follows:

(*a*) Weigh out 10 Gm. of tragacanth and place it in a receptacle capable of holding 1500 cc.
(*b*) Add 1200 cc. of distilled water.
(*c*) Allow to stand with occasional shaking until a uniform mucilage results.

Should this mucilage be prepared in large quantities, the use of a preservative would probably be necessary. Dr. Arny (6), in the "American Druggists' Formula Compendium," suggests the use of salicylic acid, one part to 1000 parts; benzoic acid, 2 parts to 1000 parts; or boric acid, 16 parts to 1000 parts.

At Hackley Hospital, a one-hundred-bed hospital, we were able to give only twenty of these enemata this past month, realizing, of course, that 20 cases are too few from which to draw definite conclusions, an analysis of these cases is interesting. Ten were post-operative patients and eight of these gave excellent results. The two remaining were fair, but were as good as with glycerin on these same patients. Seven of these twenty cases were pneumonia patients, and six of these gave excellent results, with one poor. The three remaining cases gave fair results, however, two of these cases were hemiplegics and it is doubtful whether or not anything would have given better results. A total summary shows out of twenty cases, thirteen excellent, six fair and one poor. These results are as good as can be expected from any enema and therefore we shall continue this work, keeping accurate records.

This enema is easy to make, gives satisfactory results, and involves a worthwhile saving. This saving, of course, increases according to the size of the hospital and the period of time over which this formula is used.

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SOME OBSERVATIONS ON THE USE OF OBJECTIVE TESTS IN PHARMACY.*

BY LYMAN D. FONDA.[1]

Modern educational theory advances the proposition that besides serving as a basis for selection, examinations should: (1) act as learning exercises and motivate the student to further effort, (2) enable the instructor to judge how closely learning is actually paralleling teaching, (3) aid the instructor in determining whether students have properly attained the objectives set up for the course. Experience in the fields of elementary and secondary education has demonstrated that the traditional essay examination is not adequate as a testing instrument for these purposes. While it is probably the best form of examination yet devised for some purposes, the essay examination offers several disadvantages in a program such as was outlined above. Of these, probably the most important are the highly subjective rating of essay tests and the fact that they are not customarily scaled finely enough to make their results entirely comparable.

In the light of these facts we determined several years ago to attempt the use of objective examinations as a teaching device in pharmacy. At the same time, we have continued to use the essay examinations in our mid-year and final examinations. These new type examinations are truly objective only in the provisions which they make for impartial scoring. Considering this, and in view of the fact that no examination is more valid than the basic assumptions upon which it is constructed, we felt that our first step should be a reformulation of our course aims in terms of minor objectives. Accordingly under the three headings of: (1) factual knowledge objectives, (2) ability to use facts in reasoning, (3) ability to locate and use desired information, we grouped a formidable array of specific objectives. These were gathered from such sources as: Charter's Basic Material for a Pharmaceutical Curriculum, the New York State Pharmacal Syllabus, the National Syllabus, various textbooks, and prescription ingredient surveys. From these lists we have constructed our new type tests.

At one time or another we have attempted to utilize all of the types and modifications of objective tests which we have found in various standardized tests and in literature. For the past two years, however, we have been limiting ourselves to variations of the Matching, Multiple Choice and Completion items. We felt that

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* Section on Practical Pharmacy and Dispensing, A. PH. A., New York meeting, 1937.

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the validity of the True-False type was questionable and such items offered particular difficulty in construction in order to prevent ambiguity and the danger of offering leads. Each examination must of course contain a majority of items which test for factual knowledge. However, we have consistently attempted to include a considerable number of items which are designed to test the ability of the student to reason and apply factual knowledge to a problem situation. In obtaining such items we have adopted a policy of utilizing problem situations, from laboratory or drug store practice, which have already been discussed in a class at some time or other and a record kept of the student responses. All of us have acquired the habit of recording such responses to questions, so that we now have a file of notes from which to select test items. By the use of this technique, we feel that our tests are becoming more valid and reliable, since we are utilizing responses which students actually make, rather than those which an instructor thinks they might make. Occasionally we give an open book examination in which the students are permitted to utilize textbooks in search for information necessary to the solution of the prescription incompatibility or other problems involved.

The time required for the construction of these objective examinations is far more than for the usual essay test. We found that from four to five hours were required for the construction of nearly every test when we first started. As our file of test items has increased, and we developed more skill in their preparation, this has been cut down until we now feel that an hour or two is sufficient to make out a test. If we use items from other tests and do not attempt to devise new ones, we can construct a test in about one-half hour. Accordingly, we feel that as we obtain a more complete file of proved items, the labor of test construction will be reduced to reasonable limits. Even at present, the time spent in the construction, administration and rating of an objective test compares favorably with that required for an essay examination when one considers the rapidity with which an objective test can be scored.

It has been our habit to administer monthly tests which cover, very thoroughly, the work of the past month. In addition to these, about every two months, we give a general review test which contains a representative sampling of the work of the entire course to date. For the monthly tests we customarily allow a 50-minute period, and for the general review tests from 50 to 70 minutes usually suffice. All examinations are returned to the student after they have been scored, and a portion of a class period is devoted to a general discussion of the test.

The student reaction to this program has been extremely favorable. For the first two years, we utilized these tests with only our second- and third-year classes. Early in the second year we began to have requests from Freshmen for tests of a similar nature, and many of our second-year students told us they felt that such a testing program would have helped them in their first year. The question of continuing the tests or discontinuing them in favor of more time for oral quiz and discussion has been submitted to a vote in various classes on three different occasions. In each case over 80% of the class has voted to continue the tests. Since these questionnaires were not marked for identification, we presume that this represents the honest opinion of the student body. By the same method, the students have indicated the following reactions: (1) It is necessary to study more for a series of monthly objective tests than for a like number of essay examinations. Students

admitted a tendency to "take a chance" and try and "get by" on essay tests but felt that this was impossible with the more comprehensive objective examinations. (2) Students felt that a great deal of memorizing was necessary for the objective examinations but admitted that this was no more than would be necessary, in any event, if they wished to master the subject-matter of the course. (3) They expressed the opinion that the new-type test motivated them to acquire more regular study habits because of the variety and number of questions. (4) On each of the questionnaires, approximately 85% of the students expressed themselves as feeling much better prepared and more self-confident in the semester final examinations than they would have been without such a series of objective tests.

In attempting to evaluate the possible results of this program, we have made several interesting observations. A comparison of the results of semester examinations of classes before we began the use of these tests, with those of classes which have had the tests, shows two differences. *First*, the range of distribution is more compact and there is a marked decrease in the extremely low grades since this program has been in effect. *Secondly*, the median grade has been consistently higher with classes which have had these tests. Computation of the Critical Ratio has shown that in 90% of the cases studied, this difference in median grade has been sufficient, so that it could not be reasonably attributed to chance fluctuations alone.

A comparison of the results of the semester examinations of individual classes for the year when they did not have the tests, with the results of the second year, after they had had this program, showed the same two differences (*i. e.*, decrease in spread and increase in median grade). This might be of questionable significance in itself, since it might be due to increased comprehension and greater familiarity with the work. In view of the fact that a comparison of examination results of classes before the new program was instituted did not show such marked differences, perhaps this may be taken as another indication of the trend.

Correlation of the results of various classes on these objective tests has been consistently high. The fact that we have been constantly changing test items and have, to date, made no attempt to develop standard tests, perhaps detracts from the significance of these correlations. In two cases we converted the objective test scores to percentile grades and correlated these with the results of the same class in the semester essay examination. In both cases, the correlation was surprisingly high. This may well have been accidental but presents a possibility which we are going to investigate more fully in the future.

In conclusion, it is the consensus of our instructor's opinion that the objective tests do offer a teaching device of very considerable merit. Our experience leads us to make the following summary of observations:

(1) Objective tests, at regular intervals, do offer a means by which the instructor in pharmacy may: (*a*) Stimulate study and review

(*b*) Determine approximately how closely learning is paralleling teaching

(*c*) Check on the attainment of course objectives.

(2) Both the essay examination and the objective tests should probably be used in a well-balanced testing program.

(3) The total time required to construct, administer and score objective tests is probably about the same as for essay examinations after one has acquired the experience and skill requisite to the rapid construction of the objective tests.

THE TEACHING OF MANUFACTURING PHARMACY.

BY H. G. DEKAY.*

The purpose of this paper is to give aid to the teaching of manufacturing pharmacy. The term "manufacture" is defined by Webster as "The process or operation of making wares or any material products by hand, by machinery or by other agency." The term "manufacturing" is applied to that process "pertaining to manufacture."

Content of the course may be easily gleaned from the material covered in several courses in our pharmacy curriculum. The course given at Purdue University School of Pharmacy will be used as an example of what is being done with one of this type.

According to a survey of "The Four-Year Course in Pharmacy" by DeKay and Lee (1), an effort was made to determine what courses were included in pharmacy curricula. It was found that 14 of the 20 schools included in this survey were teaching a course which it was felt should be classified as manufacturing pharmacy. These courses ranged from no lecture to $1^1/_2$ hours per week per year, while the laboratory ranged from $1^1/_2$ to 9 hours per week per year.

It does not seem probable that a course in manipulative or operative pharmacy could be taught adequately with less than one hour per week lecture and more than $1^1/_2$ hours per week laboratory for an entire school year.

In the survey, "The Four-Year Course in Pharmacy, II" (2), the same twenty schools were surveyed. It was found that 8 of the 20 schools were teaching a course which could be arbitrarily classified as manufacturing pharmacy, with the lectures ranging from none to 2 hours per week per year, and the laboratory from 2 to 4 hours per week per year.

The course in manufacturing pharmacy is taught to the third-year pharmacy students at Purdue University. It is alternated with a course in Practice Dispensing, and is therefore given each semester to one-half of the Junior Class. Its prerequisites are:

> One year of each of the following: Materia medica, beginning chemistry, analytical chemistry and organic chemistry. It consists of two hours lecture and six hours of laboratory per week for one semester. It is devised primarily to acquaint the student with quantity production with and without the aid of machinery. It teaches the student that products of the type manufactured, can be made by the pharmacist in his drug store.

The course in manufacturing pharmacy can be advantageously used in schools that have a dispensary or apothecary shop. In the School of Pharmacy at Purdue University, the Student Health Service renders medical aid to the student body and all prescriptions are compounded and filled in the Apothecary Shop of the School of Pharmacy. The total prescriptions dispensed will range between 14,000 and 16,000 annually. There is a great variety of manufactured materials required to aid in filling this number of prescriptions. The material must be made in large quantities and the manufacturing class has a very important part to play in this undertaking.

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In order to give a brief idea of the type and quantity of preparations that are being manufactured and dispensed, the following table shows the number of each class of preparations and the total quantity prepared during the past two years.

TABLE I.

Type of Preparation.	1934–1935. Number Made.	1934–1935. Quantity Manufactured.	1935–1936. Number Made.	1935–1936. Quantity Manufactured.
Capsules	1	15,000	2	50,000
Elixirs	8	132 liters	8	193 liters
Emulsions	2	28 liters	2	16 liters
Fluidextracts	3	4 liters	2	4 liters
Hair Preparations	1	12 liters	2	14 liters
Liniments	1	10 liters	5	62 liters
Lotions	3	34 liters	7	86 liters
Magmas	2	58 liters	2	25 liters
Mixtures	2	15 liters	2	34 liters
Mouth Preparations	3	302 liters	4	316 liters
Nose Preparations	1	22 liters	2	28 liters
Ointments	10	147 pounds	12	182 pounds
Powders	2	19 pounds	5	104 pounds
Solutions	3	33 liters	6	22 liters
Spirits	4	10 liters	4	16 liters
Syrups	7	249 liters	7	495 liters
Tablets	0	.....	5	98,000
Tinctures	9	47 liters	10	60 liters
Waters	3	16 liters	7	61 liters

A careful study of this table shows that the work of production embraces a variety of preparations which are commonly found in the drug store. A large number of the official United States Pharmacopœia and National Formulary preparations are being made and dispensed.

The production work is carried on under strict supervision, one instructor working with six or seven students. The preparations are carefully checked, stored and studied before they are sent to the Apothecary for dispensing. All comments and notations as to the finished product are carefully recorded in the book used for production. This added supervision gives the student a fuller realization of his responsibility to himself, the school and the student body.

The student has been made familiar with the preparation of small quantities which is a carry-over from his first or second year's work in pharmacy. In this course he is confronted with new problems and is required to call upon his training and initiative to aid him in the preparations of quart, half-gallon or gallon quantities. He no longer prepares one or two ounces of an ointment but makes it in one-pound to five-pound lots. His previous training in the manufacture of tablets has been limited but in this course he is required to prepare quantities of 1000 to 5000 at a time. He is required to review, rebuild and correlate his previous training and acquires new sensations, ideas, responsibilities and techniques in this new field of pharmacy.

The student is given an assignment and work sheet and it is his job to turn out the finished product. Using tablet manufacture as an example, it is necessary for him to first use his pharmaceutical arithmetic to increase his formula to the proper proportions. He then weighs out the necessary ingredients and mixes them

thoroughly, after which the mixture is moistened and granulated. It is then forced through the proper sieves, dried and compressed in the tablet machine. Every process is similar to those commonly used by the manufacturer of compressed tablets.

The finished product is recorded and when the written order is received from the Apothecary, it is promptly checked, recorded and filled by the student, who in turn delivers it to the dispensing room. Every opportunity is used to make this course as practical as possible so that the student can compare his products with those on the market.

This work is therefore a new and varied field for the student. His latent abilities are brought out in his pride of doing something different and worth while. What student does not get a thrill out of showing his products to his parents and friends? He has gained an incentive to carry-on and continues with zeal a course which may have untold fertile fields for him with an opportunity of making it a future profession.

The student is given a problem assignment for his term report. It is necessary for him to use the library and become acquainted with the work that has been done on his subject. It is true that the library has been at his disposal during his previous training, but at this time it becomes a necessary tool for him to use. He is given special instruction in the use of the library by the librarian who shows him how to use the card index files and find the particular reference which he is seeking. He is taught how to make a bibliography and to record the data found in his references. The knowledge gained by this assignment is not entirely confined to this course. The attention of the individual is often diverted to additional interesting items found in the journals or textbooks, which he is bound to consult.

AIDS IN TEACHING.

(1) The course in manufacturing pharmacy can be made to have an appeal for the student that few subjects possess. There is no one who has not felt a responsibility and pride in completing something worth while. This type of appeal will bring out the best qualities and abilities of the student because in previous work his preparations have been kept a short time and then discarded.

(2) A second aid in the teaching of such a course is to stress the importance of accuracy and technique in the manufacturing process. Every school of pharmacy has some form of drug assay or control. Where could an instructor find better samples for control work than those which have been prepared by the students themselves? If one knows that his work is checked and must meet certain standards, he is apt to think twice before slighting some phase of the work. If the control work is regulated and the compounder is required to explain any discrepancies in his finished product, the individual will undoubtedly tend to become more accurate in his work.

(3) The creative attitude and the urge of curiosity have always played a part in the educational process and these characteristics are stressed in this work. His problem assignment gives him the tool by which he can become efficient. After the foundation has been laid and the necessary knowledge gained, it is his problem to do some laboratory experimentation.

(4) The demerit system can be used effectively in work of this type because neatness, cleanliness and accuracy are essential to its success. If a student receives demerits for errors, unclean apparatus and working space, it soon becomes apparent what students are failing to do good work. The demerit system used embraces four major points, namely: (1) Neatness; (2) skill; (3) finished products; and (4) mistakes made in preparation.

(5) What student does not become interested in learning more about how to make new preparations and build new formulas? If there is a possibility of a new product, the work takes on new interest because of that creative spirit which is predominant in all of us. The production of new formulas has been satisfactorily used in our laboratory. The physicians in charge of the Student Health Service request a preparation for some particular use. The instructors are consulted and a careful check is made of those preparations which have been used for this purpose. Students can then be encouraged to work on new formulas and oftentimes new products are obtained having merit.

There are many aids in teaching this subject which could be suggested that can be used effectively. We are interested in new ideas and aids, but wherever the latent abilities of the students can be used effectively, then part of our teaching work has been a success, and the course will become more interesting to both student and instructor.

REFERENCES.

(1) *Proceedings A. A. C. P.*, page 39 (1929).
(2) *Ibid.*, page 49 (1935).

MINIMUM EQUIPMENT FOR ESTONIAN PHARMACISTS.

BY OSCAR LODDY.*

In recent years a number of state boards of pharmacy of this Union have made attempts to prescribe the minimum equipment for drug stores. In each case the required equipment usually has been limited to a few most essential things, such as prescription balance and weights, graduates, funnels, pill tile and spatulas.

It is interesting and instructive to compare our minimum equipment with that of Estonian pharmacies, the most progressive in Europe. Hereunder is the inventory of the minimum equipment and apparatus to be maintained by all the drug stores of Estonia, as per decree promulgated by the Department of Pharmacy of the government and reprinted in December 1937, issue of *Pharmacia:*

1 Distilled water still
1 Tincture press
1 Prescription scale and weights
1 Counter scale and weights
3 Hand scales and weights
1 Burner (Gas or otherwise)
1 Water-bath
1 Steam sterilizer
2 Percolators
1 Complex sieve
1 Pill machine
1 Cachet filler
1 Capsule filler
1 Alcohol lamp
Aerometers for estimating sp. gr.
Test-tubes and rack
1 10X Magnifier
1 Tripod

* Fitchburg, Mass.

2 50-cc. Burettes, divided into $^1/_{10}$ cc.
1 25-cc. Burette, divided $^1/_{20}$ cc.
1 Cobalt glass
1 Stalagmometer
1 Pipette, 1 cc. divided into $^1/_{10}$ cc.
1 Pipette, 5 cc. divided into $^1/_{10}$ cc.
1 Pipette, 10 cc.
1 Platinum wire
1 Thermometer from −10° to +360° C.
1 Thermometer graduated to +120° C.
1 Apparatus for taking melting points
1 Apparatus for estimating congealing points
1 Liebig condenser
Ring and burette stands
1 50-cc. cylindrical graduate
1 200-cc. cylindrical graduate
Porcelain evaporating dishes
1 100-cc. volumetric flask with glass stopper
Mortars, funnels, flasks, watch glasses, porcelain dishes, stirring rods, glass tubing, bottles, jars, boxes, etc.

In addition to above pharmacies of the first class must have also the following:

1 Analytical balance and weights
1 Volumetric flask, 50 cc. with glass stopper
1 Volumetric flask, 500 cc. with glass stopper
1 Volumetric flask, 1000 cc. with glass stopper
1 Pycnometer, 5 cc.
1 Pycnometer, 25 cc.
1 Pipette, 20 cc.
1 Pipette, 25 cc.
1 Desiccator
1 Separatory funnel, 100 cc.
1 Separatory funnel, 500 cc.
1 Apparatus for estimating boiling points
1 Sand-bath
1 Ventilator box

Manuale Pharmaceuticum III. Compiled by PROF. RUDOLF WALLNER. Published by Estonian Pharmaceutical Association, Tallinn, 1937.

As the "Pharmaceutical Recipe Book II" is a valuable addition to the working tools of American pharmacists, so with the publication of the third volume of *Manuale Pharmaceuticum* Estonian Pharmaceutical Association has enriched the pharmaceutical literature of that country. This third volume completes the series of three volumes of recipes for the use of practical pharmacists of Estonia. The first volume, consisting of formulas of the Russian pharmacopœia, took the place for a number of years of a pharmacopœia until the Estonian Pharmacopœia was published in 1937. The second volume was devoted to more important formulas of foreign pharmacopœias, including those of the U. S. P. The last volume, consisting of 1385 recipes, is closely akin to The Recipe Book, being devoted principally to formulas of a technical and cosmetic nature, including many of those sold under trade names. Dental cements, creams, nasal ointments, dental drops, foot powder, hair tonics and numerous others find their adequate treatment in this volume. The author is a well-known Estonian pharmacist and drug official. Incidentally he had an interesting paper "Estonian Pharmacy Forges Ahead" for THIS JOURNAL in 1936.

PAPERS FOR THE SECTION ON PHARMACEUTICAL ECONOMICS.

The secretary of the Section on Pharmaceutical Economics, of the AMERICAN PHARMACEUTICAL ASSOCIATION, invites teachers of subjects coming under this division and other members of the ASSOCIATION, to contribute papers for the program of the Section to be presented in Minneapolis, August 1938. Individual studies and research reports on any related phases of subjects touching finance, law, psychology and art of pharmacy are desired.

For information pertaining to program and papers, prospective contributors are asked to communicate with Prof. Joseph H. Goodness, Massachusetts College of Pharmacy, Boston, Mass.

MEANING OF TERM "DRUG" UNDER FEDERAL FOOD, DRUG AND COSMETIC ACT.

Term "Drug" means (1) articles recognized in the official United States Pharmacopœia, Official Homeopathic Pharmacopœia of the United States or official National Formulary, or any supplement to any of them; and (2) articles intended for use in the diagnosis, cure, mitigation, treatment or prevention of disease in man or other animals; and (3) articles (other than food) intended to affect the structure or any function of the body of man or other animals; and (4) articles intended for use as a component of any article specified in clause (1), (2) or (3); but does not include devices or their components, parts or accessories.

SHOULD THE CERTIFICATE OF "QUALIFIED ASSISTANT" BE GIVEN BY THE PHARMACY BOARDS AFTER 1937?*

BY ERNEST LITTLE.[1]

The question as to whether the Assistant-Pharmacist Certificate should be abolished or maintained is a question which has received considerable attention at various pharmaceutical meetings and conventions during the past several years.

I doubt the wisdom of devoting any considerable amount of time to further discussion of the whole problem at this time. There are, however, one or two aspects of the question which have been made more important by recent developments in certain states which I would like to call to your attention for your consideration.

May I, at the outset, make my position clear by saying that were I called upon, at this time, to vote upon this question in its broader aspects I should, with fair certainty, vote for the abolition of the Assistant-Pharmacist Certificate in such states as still retain it. I make this very definite statement in order that my attitude may not be clouded by the discussion which is to follow. We are, however, not so much interested in the opinion of any one individual toward pharmaceutical problems as we are in his ability to furnish some new data which may help us in arriving at as accurate as possible opinions of our own.

I fear that many of us in presenting papers of this sort sometimes display too great eagerness to establish a point, rather than to present as complete a discussion as possible. Not so long ago while listening to the presentation of a paper containing much and involved data, I thought of a comment which I recently read in one of our more prominent magazines, to the effect that a certain gentleman used statistics as an intoxicated person uses a lamp post, more for support than for illumination. It is an error to which we are all susceptible and one which I shall at least try desperately to avoid in this very brief presentation.

Fortunately in the discussion of all of our problems we start always from the common ground of what is for the best interest of pharmacy, keeping in mind, of course, the fact that no existing condition or suggested change which is counter to public welfare will in the long run prove beneficial to pharmacy, no matter how great the immediate selfish advantage may appear to be.

For this reason, I have never been overly impressed by such general statements as, for example, the fear that a certain condition or suggested change would dilute pharmacy or possibly reduce the dignity of the retail pharmacist. The addition of water to concentrated sulfuric acid (or vice versa for better procedure) results in a dilution of the hydrogen sulfate but produces also a much more potent active sulfuric acid. Any condition which enables retail pharmacy to render a greater contribution to public health and public welfare should be regarded as an enrichment rather than a dilution of the profession and should not be lightly dismissed.

Some of our states now have pharmacy laws which make it necessary for a drug store (I use that term rather than pharmacy deliberately in this connection) to have a registered pharmacist continuously in charge, even though the prescrip-

* Presented before the Section on Education and Legislation, A. PH. A., New York meeting, 1937.

[1] Dean, Rutgers University, New Jersey College of Pharmacy.

tion department may be closed. I am not contending that such legal requirements are unwise, but wish to point out that these laws have resulted in the arraignment and conviction of the registered pharmacist store owner in a neighborhood where only a one-man store can possibly be maintained.

Is it contrary to the interests of public health to allow sick-room supplies and toilet articles to be sold in a drug store by a person other than a registered pharmacist when the prescription department is closed? The physician's office may remain open in his absence and many semi-professional activities may be carried out by his nurse or office attendant in his absence.

The dentist's office need not be locked during his absence. His nurse frequently attends to such responsibilities as the changing of wedges between teeth, when the dentist is absent from the office. Have such activities diluted dentistry and endangered public health?

The average pharmacist has many more non-professional responsibilities than either the dentist or physician. Would public health be endangered if some of these were attended to by a non-registered clerk during the registered pharmacist's lunch hour?

If you answer in the affirmative I would like to ask the further question, "Could the Registered-Assistant perform a worth-while and needed service during such periods of time?" Is the ultra rigid enforcement of such laws creating a new need for the Registered-Assistant Pharmacist, which would not otherwise exist? It is essential that we should all give serious consideration to the questions asked. They are not hypothetical, or merely academic questions, but ones which may be increasingly before us.

At least one state now has a law on its statute books making it necessary for pharmacy college graduates to have at least one year of practical drug store experience in an approved pharmacy before taking the practical State Board of Pharmacy examinations. I have no intention of discussing the merits of this requirement at this time, but wish to point out a possible bearing which it may have on the question under consideration.

Even allowing for all the alleged shortcomings of our colleges of pharmacy pointed out by our severest critics, I believe you will readily and willingly admit that the average pharmacy college graduate is well prepared to safely and accurately compound without supervision, a very high percentage of the prescriptions which are to-day received by the retail pharmacist. If this is so it will, of course, be appreciated by the proprietor of the store in which the graduate works, with the natural result that the clerk will be permitted or even required to do the things which he is obviously prepared to do effectively and well. Such procedure would be illegal, but one which could be sanctioned by even the more conscientious and well-intentioned store owners.

Would it be desirable to continue or in some instances to recreate the Registered-Assistant Pharmacist for such recent graduates, in such states as have this requirement in force at the present time? Unreasonable or unwise laws are not only themselves frequently disregarded but serve to create disrespect for law in general, a fact which is regretted and depreciated by all of us.

I have not pretended to discuss the question of the Registered-Assistant in its entirety. Even a superficial survey of the literature will convince you that no such presentation is necessary at this time.

I have raised the question whether recent trends in certain states have not increased the importance of the Registered-Assistant Pharmacist question, and perhaps, made it a little more difficult to definitely answer that question than was previously the case.

LET'S NOT MISTAKE THE CAMPUS FOR THE WORLD.*

BY H. C. NEWTON.[1]

"The clamor for educational adjustments grows insistently from day to day . . . . " said Dean Alphonse M. Schwitalla, S.J., of St. Louis University in his address to the 1936 meeting of the American Council on Education. It is a clamor heard clearly in the realms of pharmacy as well as in other fields of endeavor.

Educational adjustments are closely related to curriculum adjustments. This is one of the reasons for the importance of a constant and never-ending study of the pharmaceutical curriculum by the directors of the colleges of pharmacy. For all pharmacists and especially the members of the AMERICAN PHARMACEUTICAL ASSOCIATION, the pharmaceutical curriculum should be a matter of concern and the subject of frequent discussion. A real curriculum study leads one into all the nooks and corners of the profession as well as into the general field of education. It gives one a better view of the profession as a whole and its relationship to the other professions and to the public.

To "point with pride" and to "view with alarm" are the somewhat hackneyed prerogatives of presidents and convention speakers but I venture to refer very briefly to the history of the pharmaceutical curriculum in the United States with the "pride and alarm" thought in mind.

You may recall that the pharmaceutical curriculum of the United States seems to have originated in the medical schools of the country, where as early as 1826 six out of twenty recognized medical schools included instruction in pharmacy in their curricula. Beginning with the first curriculum provided for pharmacy students in 1816 by the trustees of the University of Pennsylvania and the subsequent curricula of the Philadelphia College of Pharmacy, the Massachusetts College of Pharmacy and College of Pharmacy of the City of New York in 1821, 1823 and 1829, respectively, we find an apprenticeship of three or more years to be an integral part of the plan of study. In fact, the close association of the student with the practice of the profession as an apprentice was considered more important than his attendance at the lectures of the college professors. The starting point of the trend toward elimination of the apprenticeship as a requirement for graduation which became generally effective many years later, was, perhaps, the adoption of a pharmaceutical curriculum and the establishment of a college of pharmacy by the University of Michigan in 1868.

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* Presented before the Section on Education and Legislation, A. PH. A., New York meeting, 1937.

[1] Dean, Massachusetts College of Pharmacy.

The courses in these early days of pharmaceutical education were meager and no attempt was made to introduce subject matter which did not deal directly with the professional practice. The colleges were strictly professional schools recognizing their obligations to the public but not assuming any similar obligation to the student in his non-professional activities. From those days when the colleges and their curricula were so close to the practice of the profession down to the present when some colleges have become more or less obscure, subdivisions of large universities and some curricula resemble modified plans of premedical study with only a remote connection with the actual practice of pharmacy, seems a long stride. With the four-year curriculum came the definite acceptance of the obligation to the student for some of his education as well as to the public for his professional training. This is an advance of which we can be proud and one which will aid in the progress of the profession if we do not allow our enthusiasm in the somewhat new responsibility for the education of the student greatly to overshadow the obligation to the public for his professional training. We should view with concern, if not with alarm, the tendency to pattern our pharmaceutical curricula so closely according to those of the colleges of arts and science which do not have the same objectives. In most cases it seems that it must be either wishful thinking or expediency which causes such a practice.

It is one of the rules of good pedagogy, well illustrated in coaching for athletic competition, to return frequently to the fundamentals of the subject while attempting to master the more intricate details. This is good practice in curriculum construction, also. The objectives of the curriculum are foremost among the fundamentals in this work and one of the most important of them may be stated as follows:

To furnish the student with that basic training which will enable him to render intelligent and constructive pharmaceutical service in the community in which he practices his profession.

I would outline this service by mentioning these divisions of it:

Having available in every community an adequate supply of high-standard drugs and medicines.

Having available the knowledge, skill and equipment necessary for the extemporaneous preparation of medicines prescribed by the medical profession.

Having available the knowledge of the drugs and medicines distributed so that through proper advice the dangers of misuse of these may be averted.

Having available accurate and reliable information about public health.

Participating in research so that new or improved medicinal agents may be available to the medical profession.

No modified arts college or premedical curriculum will prepare a student for the rendering of such pharmaceutical service.

Our profession probably made a mistake when it exchanged its distinctive degree for one which so closely resembles that of the general college that its objectives are readily confused with it. Many privately agree with me in this thought although for various reasons they hesitate to express themselves publicly to that effect. Now let us not make the mistake of exchanging too many professional courses in our curriculum for those of the general college. To prepare Masters of Science and Doctors of Philosophy may be a satisfactory objective for the general college

and graduate school but it is far from the true objective of the college of pharmacy. If we allow that objective greatly to influence our curriculum construction, we shall soon be graduating "campus pharmacists" who will be no more prepared to render real pharmaceutical service than are "drug store cowboys." We must not let the gap widen between the colleges and the practice of the profession. Through our curricula we must see that our students are prepared to take their places in the world as well as on the campus. In preparing these curricula we should keep our feet on pharmaceutical ground so that our heads may not be up in the rarified atmosphere of the radical educationalist. No pharmaceutical curriculum will be perfect, because a good curriculum must provide for the more remote future professional activities of the student as well as for those of the immediate future. Wherefore even a curriculum carefully constructed after considerable study must in the end be based to some extent on the judgment of the constructor regarding future developments of the profession.

I believe the best guarantee that a curriculum will be at least a good one, in the future as well as now, is the acceptance of the thought which I have expressed on previous occasions that any curriculum constructed is "not offered as something fixed and unchanging in the years to come; on the contrary, it is expected that refinements and adjustments will be made through continuous study, evaluation and testing of the materials of the curriculum and *that it will keep pace with the progress and practice of the craft.*"

THE PRESENT STATUS OF HOSPITAL PHARMACY.*

BY EDWARD SPEASE.[1]

My subject may be viewed from a number of different standpoints, but it occurred to me that at the present moment it would be of interest to point out briefly (*a*) what the colleges are doing, (*b*) what the associations are doing, (*c*) what recognition hospital pharmacy has received and (*d*) one or two suggestions for future activities.

A bibliography has been added to the paper, which may prove useful to schools contemplating work in hospital pharmacy and which may also prove useful in the work of teachers.

In this modern age of chain stores and merchandising drug stores, I can conceive of a school where major interests may be in the fields of merchandising and purely commercial pursuits, but in the field of strictly professional pharmacy I consider a close relationship with medical and dental schools and the hospital an absolute necessity.

(A) THE SCHOOLS.

A letter was sent to the 55 schools of the ASSOCIATION as listed in the April number of *The American Journal of Pharmaceutical Education.*

Of this number, seven did not reply and the following is a brief summary, which will be found to be of value as a printed record.

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* Section, Hospital Pharmacy, A. PH. A., New York meeting, 1937.

[1] Dean, School of Pharmacy, Western Reserve University and Directing Pharmacist, University Hospitals of Cleveland.

The question asked was: "Please inform me whether your school has any relationship with or performed any service for any hospital; if there is any relationship existing at the present time; and exactly what the nature and status of this relationship is."

Alabama Polytechnic Institute — None

University of Southern California — None

Does furnish supplies and coöperates with Student Health Service.

University of Colorado — None

Just started Student Health Service in a local hospital, but no connection with any university unit.

Connecticut College of Pharmacy — None

Some graduates working in hospital pharmacies.

George Washington University — None

University Hospital and Hospital Pharmacy operate under Medical School.

Howard University

Began in October 1922 in the course, "Incompatibility and Dispensing" to send each student one hour per day, five days per week in the senior year, to the dispensary of Freedmen's Hospital, where under direction of two registered pharmacists they compound prescriptions and make preparations. About 3833 prescriptions are dispensed to hospital and out-patients monthly with no charge to patients.

University of Florida — None

Are working upon a plan.

University of Georgia — None

University of Idaho

Prepares the formulas and compounds most of the prescriptions for the University Hospital. Gives some technician courses to nurses.

University of Illinois

Started a course in Hospital Dispensing in October 1924. Each student is required to spend 50 hours in the Drug Room of the Illinois Research Hospital, a hospital of 450 beds and an out-patient department of 400 patients daily. The students are in groups of 3–5, put in part of the time during the school term and part during the summer, each filling approximately 250 prescriptions, manufacturing and filling hospital orders. The work is supervised by two registered pharmacists who are members of the Staff of the College.

The hospital pharmacy is equipped with ointment mills, a tablet machine, granulator, drying oven, autoclave and equipment for sterile parenteral solutions.

The physicians in the Dispensary are not restricted in types of medications. They do, however, restrict the use of proprietaries when an official or N. N. R. one of a similar nature is available.

Indianapolis College of Pharmacy — None

Plans are now being worked upon.

Purdue University — None

Does compound over 20,000 prescriptions annually for the Student Health Service. Manufactures preparations for the Student Health Service and furnishes the preparations for emergency dispensing. X-rays every freshman who responds to tuberculin test. Of the 2200 students entering in September 1936, took 572 pictures, developed them and sent them to the Health Service for diagnosis.

Valparaiso University — None

University Infirmary just being started and has hopes of professional affiliation with it.

University of Notre Dame — None

University of Iowa

Since 1906, the College of Pharmacy has had responsibility of the University Hospital Drug Room. Have absolute charge of hiring of help and purchasing of all drugs and dispensing them. Also responsible for all narcotics and alcohol used by Hospital or University. Work has a supervisor; also two registered and one part-time pharmacist. Also have Drug Service Department connected with the College which furnishes everything needed by laboratories or departments in the drug, chemical or reagent line. Much of this is done by pharmacy students under careful supervision.

University of Kansas

Have had charge of drug room in University Hospital of 40 beds since 1932. A pharmacy professor is in charge and is assisted by one advanced student. Certain well-qualified seniors take a course in quantity manufacturing for the Main University Hospital in Kansas City, forty miles away.

Louisville College of Pharmacy

Have succeeded thus far in having all pharmacists and pharmacy employees in City Hospital checked for qualifications by the College of Pharmacy.

Loyola University — None at present

In 1903–1904 and 1905 the teacher of pharmacy was chemist in Charity Hospital and utilized both students and preparations at that time.

At times since, the school has furnished Charity with preparations but this was stopped during Prohibition. Since 1933 students may help make preparations. Is hopeful of making progress soon against the resistance offered to proper pharmaceutical service.

Xavier University — None

University of Maryland

Since the fall of 1934, members of the instructional staff have been doing the pharmaceutical work in the Hospital and in the out-patient department of the Hospital of the University of Maryland. The plan is to assign two graduate assistants to the pharmacy in the hospital and two to the out-patient department. One is on duty in each place at all times during the day and gives instruction to students. The assistants devote half time to this work and the other half to graduate work. They have a Bachelor's degree, are registered pharmacists and are supervised by the Dean.

The School in its own laboratory manufactures practically all the preparations used in both places.

Massachusetts College of Pharmacy — None

Now making plans.

Detroit Institute of Technology — None

Now making plans.

Wayne University

Since 1935 has a direct connection with the Detroit Receiving Hospital whose chief pharmacist conducts courses in Hospital Pharmacy as a part of the regular program of study. Through the Detroit Hospital Apothecaries' Association, of which the Dean is President, an indirect contact is made with about one hundred hospital pharmacists.

University of Michigan

In 1912 they began filling prescriptions for the Student Health Service which later developed into a full-time position for a pharmacist who is under the supervision of the College of Pharmacy. Now manufacture pharmaceuticals for this service.

University of Minnesota

In 1908 the out-patient department of the University Free Dispensary was placed under a professor in the College of Pharmacy. He gave instruction to senior medical students and supervised the course in dispensary practice required of senior pharmacy students.

After the construction of the Elliot Memorial Hospital on the campus a pharmacist was placed in charge of the out-patient department. This pharmacist supervised the work of senior pharmacy students in the out-patient department only, and did not teach in the College of Pharmacy. In 1929 the University Health Service was moved to the Medical Group and the pharmacist in the out-patient department assumed the duties in connection with the Health Service. The College of Pharmacy is still sending seniors to the hospital pharmacy for practical dispensing. The College has no direct supervision over the drug room of the University of Minnesota Hospitals. The laboratories of the College supply pharmaceutical preparations made by students under supervision of the faculty to the University Hospitals, but this is not in the nature of a service enterprise. No connections exist with hospitals in the Twin Cities.

University of Mississippi None

Some attempts have been made to establish a hospital relationship.

St. Louis College of Pharmacy None

Graduates are in local hospitals.

Montana State University

During the war, the school took over training of hospital pharmacists at Fort Missoula Since then the School has given free instruction in Materia Medica to the nurses and hospital pharmacy staff of St. Patrick's Hospital, Missoula. In the new 1937 pre-nurses' training course given by the University, the School of Pharmacy offers the Materia Medica.

Creighton University None

College of Pharmacy in same building with Medical School and conducts the pharmacy service in connection with the Medical Clinic in the School of Medicine. Began service in 1907 and senior students dispense an annual average of 10,000 prescriptions. Each student spends 80 hours at this work. All is under supervision of a professor of pharmacy.

University of Nebraska

Except with the University Infirmary. They do all compounding and dispensing for the Student Health Service including the Infirmary.

Rutgers University None

Does, in conjunction with pharmacists and state medical society through a professional relations committee, carry on a plan of prescription writing taught to internes in the better hospitals of the state.

University of North Carolina None

A member of the staff makes some preparations for the infirmary.

North Dakota Agricultural College

Contemplating coöperative effort between the School of Pharmacy and a hospital whereby senior students would be permitted to spend some time in the hospital laboratories.

Ohio Northern University

None, other than graduates in hospitals and some service in an advisory capacity.

Ohio State Univerity — None

Has at various times made preparations for local and state hospitals.

Western Reserve University

The Dean is Directing Pharmacist University Hospitals. Hospital pharmacists have faculty rank. Have printed drug policy prepared by Pharmacy Committee of one medical representative from each major service, the Pharmacist and the Directing Pharmacist. Students given training. Graduate work begun in 1937. See attached bibliography.

University of Oklahoma

Since 1920, pharmacy students have dispensed medicine for the Central State Sanitorium in Norman. Number of patients nearly 2700. Seniors must all fill prescriptions for sanitorium until pronounced efficient by pharmacist in charge before receiving diploma. Furnish many preparations, reagents and do most of difficult technician work for infirmary.

Oregon State Agricultural College — None

Several attempts have been made to establish a Student Health Service, but outside pressure has prevented this. A new Student Health Service building built by aid of W. P. A. funds was opened January 10, 1937. About 1922, the Dean was a member of the Board of Directors of the Corvallis General Hospital and taught nurses.

North Pacific College

Have only had four students who have done any hospital work.

Duquesne University

When the school opened in 1925, a contact was made with Mercy Hospital and the first seniors began work in 1928. Two of the hospital pharmacists are members of the faculty, and the seniors in groups of two receive 40 clock hours of dispensing practice. A written daily report comes to the University.

Philadelphia College of Pharmacy and Science — None

At one time furnished preparations to Philadelphia General Hospital.

Temple University — No answer

Pittsburgh College of Pharmacy

Affiliated with St. John's Hospital giving special course in Hospital Laboratory Technology. (See bulletin.) Since September 1931, have worked with the Medical Center and School of Medicine in the Falk Clinic. The pharmacy in Falk Clinic is administered by the School of Pharmacy and the pharmacist is on the teaching staff. He has two graduate assistants. Senior students serve 96 hours at the clinic in project work under immediate supervision of a staff member in manufacture of preparations. Pharmacy students in this clinic contact medical, dental and social service students.

University of the Philippines

The Chief of the Department of Pharmacy is also Chief of the Department of Pharmacy of the Philippine General Hospital, with a capacity of 727 beds, besides free dispensary that treats about 300 to 350 daily. Relationship has existed since 1914.

Students are given privilege of practicing in the Pharmacy of the Hospital until they complete the three years of drug store practice required by law, to take the state board examination.

University of Puerto Rico — None

Rhode Island College of Pharmacy — None

University of South Carolina — None

Plans are now under way.

South Dakota State College None

School maintains a dispensary in the Student Health Service and also does all the clinical work connected with diagnosis. The dispensary is in charge of a registered pharmacist who fills the prescriptions, prepares the reagents and analyzes urine and blood specimens. For four years has conducted the X-ray service. Frequently performs clinical service for local hospitals.

University of Tennessee

In 1937 established a connection with John Gaston Hospital, a municipal 500-bed hospital. The medical staff appointed a dispensary and therapeutic committee of three men, and the University appointed the chief of the division of Pharmacology. The aim of the committee is to promulgate the use of U. S. P. and N. F. prescriptions in the dispensary. The dispensary uses four clerks in the manufacture and dispensing of drugs and there are about 150,000 prescriptions filled in the hospital annually. It is a charitable institution.

The school has used the hospital for teaching purposes for about twenty years.

University of Texas

When in Galveston, staff members and students assisted in the dispensing laboratory of the John Sealy Hospital. Since moving to Austin, there has been no connection save teaching of nurses in the Nurses' Training School in Austin.

Medical College of Virginia

Filling of prescriptions by students and staff of the School of Pharmacy for the out-patient department of the hospitals began prior to 1900. This connection was enlarged in June 1922, through an agreement with the hospitals that in the future they would only employ such pharmacists as are recommended by the School of Pharmacy. Since the above date the hospital pharmacists, the out-patient pharmacists, and the prescription laboratories in which both groups work have been shared with the School of Pharmacy in the teaching of dispensing pharmacy.

The State College of Washington

The Dean of the School of Pharmacy for ten years has been Head of the Finch Memorial Hospital and chairman of the College Health Committee.

The hospital is a new building, 64 beds, 4-full time nurses and will employ two licensed physicians for coming year.

Dean of Pharmacy purchases all equipment and supplies, hires the nurses and has general charge of the operation of the hospital. The hospital is supported by student fees and has a large reserve fund.

One pharmacy student puts up medicine for students for minor ailments. Prescriptions are filled at local drug stores, but copies and bills pass through the Dean's hands. Enrollment is 5000 students. Dean has served on Health Committee for 18 years.

University of Washington

Since 1922, has prepared hospital supplies for use in Student Health Service Hospital on campus. These are dispensed by the physicians and nurses.

West Virginia University None

Fills prescriptions for Student Health Service.

University of Wisconsin

Pharmacy department was first connected with a hospital in 1917. Is now coöperating with various state (hospitals and otherwise) institutions in the manufacture of several preparations.

(B) ASSOCIATIONS.

Many of the items mentioned here are known by those who have helped to bring them about. The mention of them again may be helpful to those who are just becoming acquainted with the national aspects of the work in hospital pharmacy now going forward.

In October 1936, the American College of Surgeons adopted minimum standards for hospital pharmacies.

These standards have been adopted by the Catholic Hospital Association of the United States and Canada, and it is now considering plans for a survey of its hospital pharmacies with the aim of carrying these standards into effect.

During the year of 1936, the American Hospital Association had a committee on pharmacy which rendered a report that is published in the *Transactions of the American Hospital Association*, Volume 38 for 1936, page 240.

This report should be read by all interested. It states among other things that a questionnaire will be sent out during 1937 to obtain information leading to the drafting of a set of pharmaceutical standards. A new committee was selected for 1937, and I have every reason to believe it is functioning. One of its members is a pharmacist, physician and a member of the staff of a leading hospital publication.

The AMERICAN PHARMACEUTICAL ASSOCIATION created this year a sub-section upon hospital pharmacy. I do not know if this action is merely a preliminary to the creating of a section or not, but surely hospital pharmacy is worthy of more recognition by pharmacy than this. Undoubtedly the hospital associations will form sections or give over certain meetings each year to pharmacy if the hospital pharmacists desire it, as some such meetings have already been held. The Catholic Hospital Association has had their meetings devoted to pharmacy for the past four years.

It is hoped those interested in hospital pharmacy will have an opportunity to read Sister M. Ludmilla's paper presented at the last convention upon the subject of, "Teaching Functions of the Hospital Pharmacist." It appears in the October issue of *Hospital Progress*.

(C) RECOGNITION OF PHARMACY.

This topic has been partially covered in the previous section of this paper under the heading of "Associations."

Some additional points, however, may be of value. It is impossible for the writer to know everything that has been published or done in recognition of pharmacy by hospitals, but he is familiar enough with the field to say that there has been extreme activity in hospital pharmacy during very recent years.

For many years all I read and heard of the work was done by William Gray and Irwin Becker. I am thankful to know they are both still at work and should both be quite happy to see how their child has grown.

I shall always bear in mind one visit I made to William Gray when I saw him surrounded by nursing students who were hearing about the usefulness of pharmaceutical education. The May *Bulletin* of the Presbyterian Hospital of the City of Chicago gives this picture and serves as a marker at the conclusion of 31 years of his faithful service there.

Irwin Becker was fittingly recognized by America's oldest college of pharmacy last June for the work he has done.

No two hospitals are exactly alike nor are they organized and governed in exactly the same manner, and I have found that this information is the first thing to secure before one can make any steps toward professional recognition.

Harvey A. K. Whitney has done a great work at the University of Michigan Hospital. His interneship plan is listed in the bibliography attached. I hope he will soon publish the story of his pharmacy, covering the entire field over which he has jurisdiction, for many of the things he is doing are based upon fundamental principles which you should know about. An outline of his teaching of internes and nurses should also soon be forthcoming and in case he forgets, also the story of his work with hospitals, and medical and dental societies in his state.

This month his connection with scientific medicine appears in an article in collaboration with two physicians in the *Journal of the American Medical Association*.

In our own case at Western Reserve and its University Hospitals, the bibliography is referred to where you can read it and save time. I merely wish to add that our Graduate School has approved a program of graduate instruction in hospital pharmacy, and graduate students are already enrolled and at work. In case you may not understand, let me add that we have no delusions of grandeur, we merely feel that there is a place for some hospital pharmacists with advanced degrees. This in no way minimizes the work of those of us who have succeeded without these degrees.

We are looking to the future and know that pharmacy must keep abreast of the trends in education if it is to be recognized professionally where it should be.

Proper recognition makes the going easier and the service rendered better.

(D) SUGGESTIONS.

For those who are about to undertake hospital pharmacy either in schools of pharmacy or as individuals, a few words are offered that may make some difficult paths easier.

First, learn about the organization of the hospital with which you wish to work. Then adapt yourself to it.

Remember two things you can do; one is save money for the hospital no matter what type it is, and of far greater importance is the service you can render. These are two proved facts for which we can furnish you documentary evidence for your campaign.

Also be informed that progress takes time. Perusal of this paper will show you. But new attempts now to confer with hospitals and clinics should be much easier since it has been done in a number of places.

If possible get a written drug policy for your hospital as soon as possible; it makes the going more intelligent and easier.

Get a committee of medical men with whom you can meet regularly for discussion of pharmaceutical problems so necessary to the proper conduct of a hospital.

Get your pharmacy organized and departmentized so that you know what its services and duties really are.

Make as many acquaintances with all the professional people connected with the hospital as you can.

Compile an annual report and record the services rendered whether this report be published for you or not.

Seize every opportunity to appear before professional groups that you can, and above all else, stay away from empiric medication and learn thoroughly what is meant by rational therapy.

Read regularly hospital and medical literature, as well as pharmaceutical.

The writer firmly believes that this section must see to it that sections or meetings are held in the several hospital associations each year and that pharmacy appears in hospital publications with decided frequency.

The program in the hospital associations can be of such a nature that it will be of benefit to the hospitals themselves, while in the A. PH. A. section we can devote our time to things purely scientific on the one hand which are of interest to the pharmacist himself, and on the other hand which tend to instruct our members and show them how to perform this very necessary service.

May it be asked of those of you who are now really interested that the attached bibliography on hospital pharmacy be read and send the readers' comments to the writer advising of what should be added or should be deleted. This will be of immense value in teaching.

The writer is happy in having been able to take part in this work. He feels that the work has been so successful that it will now go on forever no matter which one of us drops from the picture. Professional pharmacy, though much still needs to be done, has at last come into its own.

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LINNÆUS—THE KING OF THE FLOWERS.*

BY LOUIS H. RODDIS.[1]

Karl von Linné, the greatest botanist of all time, and picturesquely called by Jacob Riis, the "King of the Flowers," was born in a little country parsonage, at

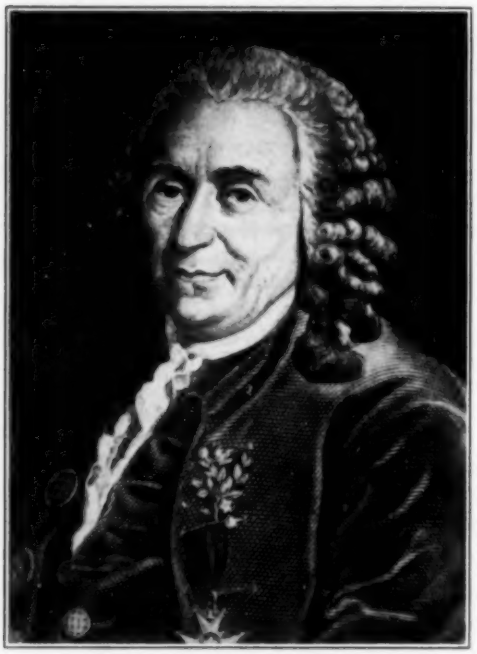

Fig. 1.—Karl von Linné.

Fig. 2.—Linné's Birthplace.

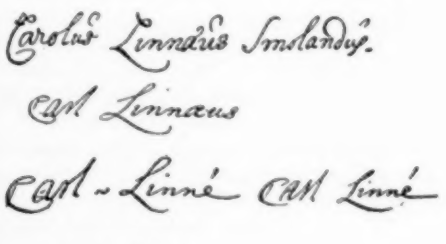

Fig. 3.

1. Carolus Linnæs Smolandus.
   (*a*) Signature on matriculation at Upsala, 23 Sept., 1728.
2. Carl Linnæus.
   (*b*) Signature in 1755.
3. Carl v. Linné.
   (*c*) Signatures in 1765.
4. Carol Linne.
   (*d*) The last signature known, 1777.

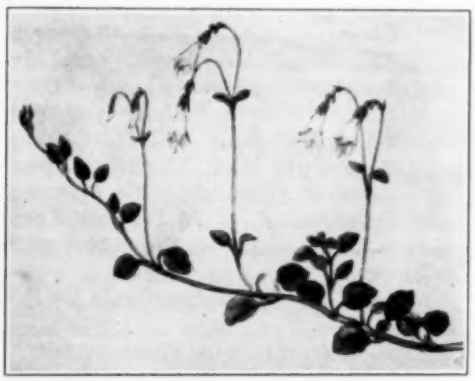

Fig. 4.—Linnea borealis.

Rashult in the province of Småland in southern Sweden, between the hours of midnight and one o'clock of May 13, 1707.

* Presented before the Section on Historical Pharmacy, A. PH. A., New York meeting, 1937.

[1] Commander, Medical Corps, U. S. Navy.

The life and work of Linnæus is of interest to all pharmacists as the greatest contributor to one of the basic sciences of pharmacy.

The environment from which a great man comes is always interesting. Småland is an agricultural province, with little fields walled in by the stones taken from the land by generations of hardworking peasantry. The province has supplied more emigrants to the United States than any other part of Sweden. "America-fever" led many a young man and woman to leave "poor Småland," and numbers of their descendants are our neighbors here in Minnesota. Another emigrant that has carried the name of Sweden to the farthest corners of the land is the safety match, most of which are made at the great industrial city of Jonkoping. The province is dotted with shining lakes. Rashult stood on the shore of one of these and the ground in front of the old parsonage sloped down to the water's edge.

The name of the father of the little boy destined to be one of the world's greatest men, was Nils Linnæus. The name had originally been Lindelius and also Tiliander, taken from the great linden or basswood tree, which stood near the family homestead and now commemorated as the genus Tilia to which the basswood belongs. It seems fitting that a botanist should be named for a tree and so handsome a tree as the linden. Although his name was Linné and later when ennobled, the aristocratic "Von" was prefixed, the botanist is known to the world very largely by the Latinized form of Linnæus. The father was a poor country clergyman. It is a remarkable fact that more great men have come from the families of the ministry than those of any other profession. Even the log-cabin boys of America headed by Abraham Lincoln, are less numerous than the sons of the rectory and the manse.

The mother's name was Christina Brodersonia. She was the daughter of the previous minister at Rashult, so Linnæus had a double clerical descent. The father was thirty-three, the mother eighteen years of age. Carl was the eldest of the five children. The father was an ardent gardener and horticulturist, who supplemented the scanty income of a country pastor, with vegetables and fruits for the family table. Carl grew up in a garden and early showed his love and interest in plants. It is said that when a baby his mother would give him a flower to play with if he fretted.

He was intended for the ministry but showed such little aptitude in the preparatory studies for that profession, that he was considered something of a dunce by his teachers, and it was even recommended to the father that he be apprenticed to a shoemaker as he would never make his mark in a learned profession. Fortunately, the father did not heed their recommendation, and lived to see this backward boy rich and famous, covered with honors by his own and many foreign countries, and acclaimed throughout the world as one of the greatest men the human race has produced.

As a physician it is a pleasure to me to record that it was a medical man, Dr. Rothman, the town physician, who expressed the belief that the young Linnæus would distinguish himself in medicine and the natural sciences. He took the youngster into his home and became his medical and science preceptor. In 1727 his pupil entered the University of Lund, and in the following year went to Upsala, one of the oldest and most celebrated universities of Europe.

The young man was as poor as Job. It is said that, having no money to pay a cobbler, he reinforced the worn soles of his shoes with birch bark, a practical example of the use of economic botany by the future botanist. But, though poor in money, he was rich in other respects. He had a handsome person, an amiable disposition, and enthusiasm for the knowledge of nature that was unequalled, and a mind as clear and bright as a diamond. His shining talents attracted the attention

of two famous professors at Upsala; Celsius and the younger Rudbeck, the latter professor of botany. Rudbeck was then an old man and physically unequal to perform all his duties. Recognizing the abilities of Linnæus he employed him as his assistant. He also obtained a small state grant, 1530 copper dollars, about $125.00 of our money to-day, to send the young man on a botanical journey to Lapland. With this small sum Linnæus made one of the most famous of scientific expeditions, a one-man scientific mission in which he traveled 4600 miles, made many important scientific discoveries, and brought back a large collection of plants, animals and minerals. His account of the journey deserves a place beside Darwin's "Voyage of the Beagle," as a classic narrative of exploration in the cause of science. He omits nothing of interest, even not forgetting to mention that a minister with whom he stayed for a time had an extremely pretty daughter. Here is the way he describes the equipment of the expedition:

"I carried a small, leather bag * * * * * * furnished on one side with hooks and eyes, so that it could be opened and shut at pleasure. This bag contained one shirt, two pairs of false sleeves, two half-shirts (undershirts), an ink-stand, pencase, microscope and spy-glass; a gauze cap to protect me occasionally from the gnats, a comb, my journal, and a parcel of paper stitched together for drying plants, both in folio; my manuscripts, *Ornithology*, *Flora Uplandica* and *Characteres Generici*. I wore a hanger at my side and carried a small fowling piece, as well as an octagonal stick graduated for the purpose of measuring. My pocketbook contained a passport from the Governor of Upsala and a recommendation from the Academy."

The success of this journey led to an invitation from the Governor of Dalecarlia or Dalarne, as the Swedes often call this beautiful province, to travel there as he had done in Lapland. He made this journey also, and at Fahlun, the principal mining town of Sweden, lectured on metallurgy and assaying. He was advised by a chaplain at Tahlun to go abroad and take a medical degree. In 1733 he went to Holland for this purpose. On the way there he stopped for a time at Hamburg, where there was a municipal museum, boasting, among other wonders, a serpent with seven heads. Linnæus soon determined that the whole thing was a hoax and the heads had been made by skilfully placing the skin of serpents over the skulls of weasels. The curiosity, however, was worth money as an attraction to tourists. A fee was charged to see it and in fact it had been pledged by the Board of Elders of the city as security for a loan of 10,000 marks. What corresponded to the local Chamber of Commerce and Kiwanis Club did not view the young enthusiast's debunking of the pride of the museum with favor, and in fact he was advised by a friendly physician to leave town at the earliest opportunity, which he did.

In Holland he took his medical degree at Harderwijk, his thesis being on intermittent fever. He then visited Leyden, where the great Dutch clinician, H. Boerhaave, was professor of medicine. Boerhaave's reputation was so great that a Chinese mandarin sent him a letter addressed simply "Dr. Boerhaave, Europe," which was promptly delivered. Linnæus spent the years 1735–1738 abroad visiting England and France, making many friends, particularly among botanists. In Holland a wealthy banker and ardent amateur horticulturist, G. Clifford, who had a magnificent garden near Haarlem, invited Linnæus to live with him, arrange his herbarium and garden and to publish an account of them. The description, published under the title "Hortus Cliffortiensis," is a botanical classic. In Holland, too, he began the publication of his really important works, such as "*Systemæ Naturæ*," "*Genera Plantarum*," "*Fundamenta Botanica*" and "*Critica Botanica*,"

books from which modern systematic botany may be said to have taken its departure.

Upon his return to Sweden in 1738 Linnæus began the practice of medicine in Stockholm. He was appointed a "resident physician" in the Navy, so that naval surgeons should be proud to own him along with Darwin, Huxley, Richardson and a host of others of their number, who have made great places for themselves in the annals of science. He was a most successful clinician, and came finally to number even the Queen among his patients. As was to be expected, his practice became very lucrative. He was unhappy, however, because he had no time for his beloved plants, and said to a friend, "Once I had plants and no money, but I was happy; now I have money but no plants, and I am unhappy." He wished to obtain an appointment to the chair of botany at Upsala. It was necessary for him, however, to accept instead the chair of medicine. He became professor of medicine there in 1741, but soon exchanged for the coveted professorship of botany. In this position his knowledge and love of natural history, his enthusiasm and his great gifts as a lecturer and teacher soon made him famous and attracted students from all over the world. The old Swedish university became the Mecca of naturalists. The ordinary enrollment at Upsala at that time was about 500, but it soon trebled. Linnæus built up a great botanic garden with special gardens for Scandinavian plants, Bible plants, economic plants, medicinal plants and greenhouses full of tropical and exotic species. In his *Hortus Upsaliensis* he described this garden and the 1100 additions to it he had made. He also made two journeys through Västergöthland and Skøne, similar to his Lapland and Dalecarlian expeditions, and published excellent and popular accounts of them. Other important works were a flora and a fauna of Sweden, for which he had made collections and observations for more than fifteen years. In 1750 appeared his *Philosophia Botanica*, in which he comments on the axioms of his early book on the fundamentals of botany. In 1753 appeared his most important published work, the *Species Plantarum*, in which the specific names and descriptions, most of them still in use, are set forth. His *Materia Medica*, considered by many of his contemporaries one of his most important works, was also printed about this time.

Honors, money and the friendship and patronage of kings and queens were almost forced upon him. The Swedish King, Frederick I, reëstablished the two famous Swedish orders of knighthood, the Order of the Seraphim, or the "Blue Ribbon," the Order of the Sund, or the "Yellow Ribbon," and founded the Order of the Polar Star or the "Black Ribbon." The latter was to be a special order for civil merit. Linnæus was made a knight of the Polar Star in 1753, the first man of science in Sweden to receive this honor. His patent of nobility was antedated to 1748. The badge of the order is a white cross with a five-pointed silver star on a blue medallion in the center, the whole suspended by a black ribbon of watered silk. Linnæus was extremely proud of this distinction and nearly all his later portraits showed him wearing the handsome insignia of the Order.

The arms chosen prominently displayed three crowns symbolic of the three realms of nature, the animal, vegetable and mineral kingdoms first clearly defined by Linnæus. The motto was "To extend fame by deeds."

The King also built a handsome house in the grounds of the botanic gardens as an official residence for the professor of botany, so that he might always be in

the midst of his beloved plants, that they might benefit from his care, and his knowledge be enriched by the greater opportunity for observation. Linnæus received so many gifts, prizes and fees, that combined with his salary and official emoluments, he became extremely well to do if not actually wealthy. He bought a country place at Hammarby close to Upsala, and built a fine home there for his family to inherit. The King gave him a pension, and two farms, and 500 pounds sterling was paid for the secret of making pearls which Linnæus had developed, and was similar to that used by the Japanese pearl fishers to-day. Both Linnæus and the Government believed this to be a discovery of great value. The King also appointed the eldest son of the great botanist to be Assistant in Botany at Upsala, with a promise that he would succeed to the professorship on the death of his father.

The King of Spain invited him to settle there, offering him a liberal salary, full exercise of religious liberty and a patent of nobility. He was to be the royal botanist and to make a survey of the plant resources of the great Spanish colonial empire in the New World. Had he accepted he might have anticipated much of the work of Humboldt. Linnæus, however, who was very patriotic, declined this offer, saying that any talent he possessed should be used for the benefit of Sweden. His favorite, and in his opinion most gifted pupil, Löfling, was sent in his place.

The influence of Linnæus was multiplied through his numerous pupils, who revered him as the king of their loved science. He not only made botany the favored science of the Swedish people, but through his pupils he gave direction to scientific research in it for a hundred years, not only in Sweden, but throughout the world. His pupils and numerous correspondents supplied him with specimens, drawings and descriptions. A Swedish sea captain brought him living specimens of the tea plant, which to the sorrow of Linnæus, could not be grown on a commercial scale in Europe. He received also a cactus covered with cochineal insects which were destroyed by a gardner who thought them harmful parasites. Among the most famous of his students were:

P. Löfling, whose name is connected with the Spanish flora; P. Kalm, the author of a celebrated account of his travels in North America before the American Revolution; Hasselquist, who described the flora of Asia Minor, Forskel, that of Arabia, Sparrman, that of South Africa, and accompanied Captain Cook on one of his Antarctic voyages; and Thunberg, who described the flora of Japan. These and many others carried the teachings of Linnæus and his love and enthusiasm for botany all over the world, and passed it on in their native land to such effect that it is safe to say that Sweden has produced more botanists in proportion to its population than any country in the world.

A striking instance of the fame of Linnæus at this time was the fact that the Pope, who had forbidden the use of his books seventeen years before, now issued a decree that no other texts on botany were to be used officially but those of the Swedish botanist. The Empress Marie Theresa of Austria congratulated the ambassador from Sweden that his country had such a luminary in the world of science as Linnæus, and Frederick the Great of Prussia is said to have addressed him as the "Prince of Botanists." The Russian Academy offered a prize for an essay on the utilization of the natural resources of the plant kingdom. This was a favorite subject with Linnæus, who was always particularly interested in economic botany. His essay won the prize and the pseudonym he used "*Illuminat*," "He illumines," was placed on the medal given him.

What did Linnæus do, we may ask, that he should receive all these honors? What were the achievements that place him in so high a position as a naturalist? They may be summed up as follows:

(1) Linnæus established the importance of the pistils and stamens not only as the sexual organs of plants, but as an important part in the orderly classification of plants. Caesalpino, the great Italian physician and botanist of the sixteenth century, the virtual founder of systematic botany and a forerunner of Harvey in the discovery of the circulation of the blood, had two centuries before stated the fundamental doctrine that—"in the fruit and seeds of plants we have the key to their affinities." This was forgotten by those who followed him, and the outer floral structure, the petals and sepals, were the principal things considered in the classification of plants. The important sexual parts of the flower, the stamens, the pistils, the stigmas and the ovary, were disregarded. Both the binominal nomenclature and the use of the pistils and stamens in classification seem simple things and it is difficult for a botanist to-day to realize what epoch-making innovations they were. Yet they created a new era in the science.

(2) The binominal method of naming plants and animals was one of the greatest advances in biology and brought order out of chaos in the classification of plant and animal life. Each species was given two names, a generic and a specific name, thus: *Primus virginiana*, the chokercherry. The meaning of the binominal method of naming plants and animals is best understood by an example from the names of people. If there were only given or Christian names, the world would be full of Johns, Georges and Williams, and Sarahs and Marys, and no designation to show which were brothers or sisters. By the use of two names, that is by adding surnames such as Smith, Jones or Johnson, the Johns and Sarahs become grouped in their proper family relationship. This is what occurred with the use of the binominal method; related species of plants or animals were quickly classified. It was all the more needed on the tremendous additions to the known flora and fauna of the world from the discoveries of the New World and the Exploration of the Asiatic African and Australian continents.

(3) The division of all natural objects into the three kingdoms, animal, vegetable and mineral.

(4) His enthusiasm for botany and natural history created world-wide interest on that subject so that, in the words of another great Swedish botanist—"Natural science, formerly a neglected child, who seldom came into view, soon became a cherished possession of high and low, old and young."

(5) He elevated science to where it attracted the attention of people both in the highest and lowest walks of life. He was the greatest propagandist for science of all the followers of science.

(6) He made many important contributions to economic botany, and was a pioneer in ecology and plant geography.

(7) He was one of the founders of geology. He began the comparison of strata of one locality with those of another, and propounded the theory of a fixed sequence of strata over the whole earth, a fundamental idea in paleontology.

(8) As a mineralogist he drew attention to crystallization forms as a basis of classification.

(9) As a medical man he described aphasia and re-awakened interest in dietetics and dietetic therapeutics. His use of strawberries in arthritis and gout is of interest in the light of recent research. Linnæus drew attention to parasitic "small animals," as causes of certain skin disease. He opposed the excessive blood-letting so universally practiced in his day, mentions the value of electricity in the treatment of disease, and generally showed in medicine, as in natural history, that he was in many respects, in advance of his time.

Linnæus married, in 1739, Sarah Elizabeth Moraea, the handsome daughter of the town physician of Tahlun. He had been betrothed to her before going abroad, but marriage had been opposed by her parents until Linnæus had completed his studies in Holland, taken his medical degree and become able to support a wife and family, not an unusual demand to be made by parents. His wife turned out to be something of a Tartar. She was so thorough a housekeeper and she kept the house in such a state of disorder from cleaning that it was little of a home. She

kept her husband "under the slipper," as the Swedish call petticoat government, and more serious still she had an unusual dislike of her eldest son. With all her faults, however, she was loved by Linnæus, and though some have declared his domestic life unhappy, it is doubtful if Linnæus was dissatisfied with it, and in expressing thankfulness to his Creator for certain benefits, he mentions among others that: "God gave him the wife he most desired, who kept house for him while he worked."

Linnæus was apparently extremely fond of his wife and children. He had two sons and three daughters. The youngest daughter was probably his favorite child. She was still-born, but was brought to life by insufflation, Linnæus applying his lips to hers and gently blowing air into her lungs. He was very religious and among a number of autobiographic notes which he made are the following memoranda in which he set down his feelings of respect and thankfulness to God for benefits received. They constitute in a sense a sort of biography and estimate of his life, character and achievements. He uses the third person in referring to himself:

God has conducted him with his own Almighty hand;

God has let him grow up from a trunk without root, planted him on a distant, splendid spot, let him grow into a considerable tree;

God has given him so ardent a mind for science, that it became the most desirable aim in life;

God ordained that all suitable means should be available in his time to aid his progress;

God so directed him that his failure to win what he wanted became his greatest advantage; caused him to be taken up by patrons of Science, even by the highest in the King's Palace;

God gave him the best and most honorable duty; precisely what he most desired in the world;

God gave him the wife he most desired; who kept house while he worked;

God gave him children who were good and virtuous;

God gave him a son as successor;

God provided him with the greatest herbarium in the world, his greatest delight;

God bestowed goods and other possessions, so that there was nothing superfluous, nothing wanting;

God honored him with a title of honor, knight and nobleman, and made him a great name in the learned world;

God preserved him from fire;

God preserved his life beyond sixty years;

God let him see more of his created world than any mortal before him;

God bestowed upon him the greatest insight into the knowledge of Nature, more than anyone had hitherto enjoyed.

Like every great naturalist, Linnæus had a remarkable memory. It is said that at one time he could name and describe over 7000 plants. This memory began to fail in old age and in the last two years of his life he could not even remember his own name. It is safe to say that he assigned the aptly descriptive scientific names now in use to nearly 10,000 species of plants and many animal species as well. One has only to glance through a descriptive botany and note the "L" after the specific name, indicating that it was given by Linnæus, to realize that nearly every important scientific name for plant species originated with the great Swedish naturalist.

In his home, in his garden, his herbarium, and with his insect and mineral collections, Linnæus was very happy. In his study he had on the wall the pictures

of famous botanists and naturalists. Here in this beautiful home, with his wife and children, engaged with his studies and his pupils, honored by high and low both in his own country and abroad, Linnæus was very happy.

He had suffered a stroke of apoplexy in May 1774, and the increasing infirmities of old age finally brought him to his grave. In 1776 there was the following pathetic entry in one of his diaries:

"Linnæus limps, can hardly walk, talks confusedly, can scarcely write." He died on the 10th of January 1778, at eight o'clock in the morning. He was buried in the cathedral at Upsala. Many memorials have been raised to him, including the handsome statue in Stockholm, but none are more beautiful or more appropriate than a little lowly flower he himself discovered on his Lapland journey and named for him the "*Linnea borealis*." The most fitting memorial for a botanist is a flower, and this little evergreen plant of the north, creeping on the ground, and blossoming almost from the snow, typifies at once the great botanist's modest origin, early struggles against adversity and his later flowering in a bloom that commanded the attention and admiration of the whole world. The *Linnea borealis*, as its specific name implies, is a native of the northern latitudes. The flower is beautiful, a snowy white bell streaked with purplish pink. The plant was an especial favorite of Linnæus. There is an American variety, "americana," considered by many identical with the "borealis."

In appearance Linnæus was of rather short and stocky build. His countenance, as may be seen from the portraits, was pleasing. His eyes were brown and his hair, in youth, flaxen. As a young man he was erect and active but by the time he was fifty he had become somewhat bent and his gait was shuffling in character. When talking or when lecturing to classes on botany his face fairly beamed with enthusiasm and interest for his darling science. He seemed to radiate this interest to his listeners and it was this quality as much as his marvelous knowledge that captivated his students and made him so great a teacher.

BIBLIOGRAPHICAL NOTES.

The most important and definitive biography of Linnæus is in Swedish and was written by the veteran botanist, T. M. Fries. In 1923 this was translated in a much abridged form by B. D. Jackson. This translation is published by H. F. and G. Witherby, London. It is well illustrated and gives the important facts about Linnæus and is the only modern work on him in English book form.

Stoever, D. H., "Life of Linnæus," in German, was published at Hamburg in 1792 and was translated by J. Trapp, London, in 1794. An old volume long out of print, it is a very interesting biography. Stoever was almost a contemporary and knew many of the pupils of Linnæus. Some of his material is, therefore, of particular value and his is a source book for many later biographies.

A charming book in English is Mrs. Florence Caddy's "Through the Fields with Linnæus." This is not so much an ordered biography as a trip through Sweden, describing the country and giving a running account of the naturalist's life with the description of travel. It is delightfully written, freely illustrated and reading it is a most agreeable way to become acquainted with Linnæus.

E. L. Green wrote a brief account entitled "Carolous Linnæus," published in Philadelphia in 1912. Two other accounts, D. C. Carr's "Life of Linnæus" written in 1837 and a "Life of Linnæus" by Miss G. L. Brightwell written in 1858, I have been unable to procure and have not seen.

Richard Pulteney, the author of a biographical history of English botany, published in 1781 "A General View of the Writings of Linnæus" which was probably the first account in English.

THE DEPARTMENT OF THE AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY

RECENT DEVELOPMENTS IN THE WORK OF THE AMERICAN COUNCIL ON EDUCATION.*

BY RUFUS A. LYMAN.[1]

I have been asked to discuss this subject by the Chairman of this Section,[1] largely, I suppose because, for some years I have represented the American Association of Colleges of Pharmacy in the work of the Council. In doing so I think it will be worth while to give a brief résumé of the history and purposes of the American Council on Education. This is almost necessary to appreciate the magnitude and the comprehensiveness and the spirit of its activities. There is nothing original about the presentation of the history and the work of the American Council, it is a statement of historic fact taken largely and often verbatim from the records of the American Council on Education.

The Council had its inception in the days of the World War. It came into being early in 1918 as the result of a conference of prominent educators in Washington who recognized the necessity of coördinating the efforts of educational associations and institutions as a part of the program for national defense.

As a result of this conference the "Emergency Council on Education" was organized and its purposes set forth as follows: "To place the educational resources of the country more completely at the service of the national government and its departments to the end that, through an understanding coöperation, the patriotic services of the public schools, colleges and universities may be augmented; that a continuous supply of educated men may be obtained; and that a greater effectiveness in meeting the educational problems arising during and following the war may be secured." That there was need for such an organization was shown by the fact that immediately the President of the United States asked the Council for assistance in a nation-wide campaign in behalf of American Education. The Surgeon General of the United States Army asked the Council to use its machinery to enlist ten thousand young women in nursing. The Council of National Defense asked the Council to take charge of the visit of the British Educational Mission and asked it to develop closer relations with French and Spanish educators. The Emergency Council at the beginning included fifteen national educational associations. The Emergency Council early realized that there would be as much need for coöperative educational endeavor in time of peace as in time of war. They also saw that there would be a need for an agency that would work for the development of better relations with foreign educational institutions. The name of the Emergency Council was therefore, in July 1918, changed to the American Council on Education.

Universities and colleges throughout the country became interested in the new organization and in order that the Council might benefit by their interest, late in

* Section on Education and Legislation, A. PH. A., New York meeting, 1937.

[1] Dean, School of Pharmacy, University of Nebraska, representing the American Association of Colleges of Pharmacy.

the year the constitution was changed so as to provide for the inclusion of institutional members, representing accredited colleges, universities and technological schools and for the inclusion of associate members, representing organizations with interests related to the work of the Council.

As the program of the Council expanded, it became increasingly evident that educational problems of colleges and universities had their roots in the primary and secondary schools of America. Recognizing the importance of having the entire American educational system represented in the Council, the Executive Committee in October 1935, opened the institutional membership of the Council to the forty-eight state departments of education, and to the city school systems serving a city population of at least 200,000.

The number of members has grown steadily through the years until to-day twenty-nine constituent members, twenty-eight associate members, and three hundred twenty-six institutional members are actively participating in the work of the Council.

The Council is financed by membership dues and by generous grants from educational foundations.

The Council meets regularly once a year on the first Friday in May to elect all officers, the members of the Executive Committee, and the members of the Committee on Problems and Plans in Education.

In the United States, contrary to the situation in almost all other countries, the central government does not control schools and higher institutions. Legally, therefore, the development of educational policy and practice has been left to state and local school systems and to privately controlled educational institutions. Actually, much of this development has resulted from the mutual exchange of experience and observations which takes place in the almost innumerable national, regional, state and local educational associations and conferences.

Where so many educational organizations, each with its own particular interests, are at work there is frequent need for an agency to facilitate coöperation among them. This is the purpose of the American Council on Education. The American Council on Education is, therefore, a council conducted by a large number of national educational associations, higher institutions and school systems, to coöperate in devising practical means of meeting the basic challenges of American education. Not only educational practices but also the larger purposes of education come within the province of the American Council.

Since its establishment in 1918, the Council has reflected the peculiar genius of the American educational system, a system without national control, comprising a vast number of autonomous units working together voluntarily for the establishment of educational standards. Similarly, the American Council on Education has promoted common action in matters of common concern without invading the autonomy of institutions and interests within the American educational system. The Council devotes itself to scientific inquiry, to the provision of means for consultation, and to the stimulation of experimental activities by institutions and groups of institutions. Through conferences and investigations it seeks to clarify educational issues of national significance, to define problems and to enlist appropriate agencies for their solution. As a result of the exchange of opinion and the discovery of facts it fosters agreements designed to improve educational practice. Thus the

Council acts as a mobilizing force for the energies of the American educational profession.

Most of the activities of the Council are carried on by committees led by the Executive Committee and the Committee on Problems and Plans. The latter committee is responsible for planning and supervising all research activities.

A brief description of the work of a few of the committees will give some conception of the scope of the work of the Council now under way.

The Sub-Committee on Academic Freedom and Social Responsibility has been commissioned to survey the various phases of freedom and the desired relationship between educational institutions and society. Coöperating in this work is the American Association of University Professors, the Social Science Research Council and the American Association for the Advancement of Science.

The Sub-Committee on Coöperation among Institutions of Higher Education is trying to find methods by means of which institutions in given areas may reduce unnecessary and expensive duplication.

The Sub-Committee on the Place of Radio in Organized Education is making a survey of the present use of radio in organized education and report on the possibilities of using this new medium.

The Sub-Committee on Research Fellowships and Grants-in-Aid of Research in Education during the past year has prepared a report revealing the great need for competent men and women in the field of educational research and showing the inadequate subsidy for research in education as compared with the natural sciences, the social sciences and the humanities. A definite proposal for the support of a system of post-doctoral fellowships in education has been made.

The Sub-Committee on the Study of Business Education in Coöperation with the American Association of Collegiate Schools of Business will consider means of formulating a more effective consensus of opinion concerning business curriculum practices.

One of the outstanding studies is that of the American Youth Commission, headed by Newton D. Baker and Owen D. Young. A grant of $500,000 has been made to study the problems concerning the education of American youth from the age of twelve upward.

Studies are being made in employment, health, education and recreation, the general factors affecting all young people. The Commission is also studying the characteristics of youth and the influences to which they are subject. The plan is to encourage the translation of the best that is known into practice on a nation-wide scale.

The Financial Advisory Service has been organized to provide service, information and advice in the field of financial and business administration of educational institutions and systems. The facilities of the service are available to all colleges, universities and other educational organizations.

The Committee on Motion Pictures in Education is directing its efforts toward the development of a wider and better use of motion pictures in education.

The Committee on Coöperative Study of Secondary School Standards is formulating improved standards for secondary school evaluations.

A committee is at work at the invitation of Senator Copeland to coöperate with his Education and Law Conference to promote an experimental study in character education in the public schools of the District of Columbia.

A Committee on International Aspects of Education is working toward the securing of all possible assistance from foreign countries in the solution of American educational problems.

Time does not permit the covering of the entire field of activities and studies which are being carried on by the American Council, but sufficient has been said to give a fair conception of the scope and importance of its work.

While the things I have been reviewing are of great importance to every and all phases of human activity, there are those who will want to know specifically, just how pharmacy comes into the field of activities of the American Council on Education. Those who have followed the development of pharmaceutical education in this country will recall that for many years the American Association of Colleges of Pharmacy had a standing committee whose efforts were directed toward getting some foundation to make a study or survey of the whole field of pharmacy, comparable to the one made of medicine and other professions, by the Rockefeller Foundation. This was never successful. In the middle of the last decade Dr. W. W. Charters made a comprehensive study of pharmacy, the object of which was to find out the part the pharmacist plays in community life. This study was financed by the Commonwealth Fund and the results of the study were published in 1927 under the title, "Basic Material for a Pharmaceutical Curriculum." This study was of far-reaching value to pharmaceutical education and practice. In 1928 some hope was held out that a study of pharmacy covering a larger field might be undertaken by the American Council on Education, if the funds could be obtained. With this in view, the American Association of Colleges of Pharmacy joined the American Council on Education as a constituent member. After a few years when the money for the proposed study did not materialize and the study was not undertaken, the question was raised by a number in the pharmacy group as to whether the American Association of Colleges should continue its membership in the American Council. The writer, who was the representative of the Colleges in the Council, raised the question with Dr. C. R. Mann, Director of the Council, as to the wisdom of the American Association of Colleges of Pharmacy retaining membership in the American Council on Education. I quote Doctor Mann's reply in full because it is a fine analysis of the problems which confront us and it shows the way in which the work of our Association is related to the whole problem of education.

My dear Dr. Lyman:

Thank you for your good letter of March 16th. I appreciate your giving me a chance to answer your questions.

I am not surprised that the Association of Colleges of Pharmacy raises these questions. As you know, this Council has been involved in a lengthy argument as to its future organization and policy. This has seriously interfered with its activities for the past year. The questions involved will doubtless be finally settled at the annual meeting here in May. As I see it, American education is in for a large self-reconstruction in which the Council will play an increasingly important rôle, whatever the decision as to its own reorganization. In this pending reconstruction the schools of pharmacy are in a position to take a leading part because, as was brought out at our Atlantic City meeting several years ago, they already have the basic studies of Charters on which to develop a really effective curriculum. I have always regretted that the plan formulated

at that Atlantic City meeting was not carried forward. It is the sort of plan which all schools must follow if they are to meet the requirements of the changing world.

You will recall that Wilbur in his address to the Council in May 1932, stressed the need on such reconstruction in medical education. You of course understand that such fundamental reconstruction requires considerable preliminary work in the lower schools and it is in the field that the Council has concentrated its efforts during the past several years, laying a foundation in records and types of testing that will enable the structure of the higher schools to be erected with greater certainty. As soon as the Council's problems of reorganization are settled we shall, I hope, be ready to go forward with the colleges and professional schools.

While professional schools seem independent so far as their own curricula are concerned, they must necessarily build on a common foundation of secondary schooling. It is at this point that participation in the Council is essential for the higher schools. The lack of interest of the professional schools in the Council seems to me to be due to the fact that higher schools do not yet recognize fully the profound influence which lower schools have on the higher. If the professional schools would coöperate more fully with the Council in its work with the lower schools, progress would be more rapid and the immediate benefits to the higher schools would be more obvious. A professional school cannot work effectively by itself on the lower schools. It must work through an integrating organization like the Council.

From this point of view I should like to ask your Association to consider not primarily what are you now getting from the Council, but rather what you should be contributing to the work of the Council in reorganizing the lower schools so as to supply a sound foundation for your advanced work. The basic problem for every advanced school is the selection of students who are properly qualified to go into the particular profession concerned. Effective means of making this selection must be developed in the lower schools. If the Council's techniques of testing and recording student achievement increase the accuracy of selection in schools of pharmacy by even five per cent, the schools of pharmacy have secured a return on their investment in this Council which is worth vastly more than what it costs and which cannot be secured in any other way.

For the foregoing reasons I hope the schools of pharmacy will continue to coöperate with the Council and will turn their attention more specifically to these basic problems of preliminary training and selection of suitable candidates. The techniques developed at this lower level will be found effective in constructing curricula, measuring achievement and setting standards for the higher schools. So do not get discouraged because the Council has been in something of a jam this year. Come to the annual meeting in May and help us complete the reorganization of the Council so that its work may continue to increase in usefulness and vigor in the future as it has in the past.

Cordially yours,
C. R. MANN, *Director*.

Although Doctor Mann practically said it in this letter, I did not realize until some time later that the American Council on Education was not nearly so much interested in what it could do for pharmacy as it was in what pharmacy could do for the work of the American Council in the field of education in general and in the field of professional education in particular. In other words, I finally came to the understanding that we should belong to the American Council of Education for what we can contribute and not for what we can get. It is the philosophy which Dr. Edward Kremers of the University of Wisconsin has preached for a quarter of a century, when he has insisted that research pharmacy must become productive and not be parasitic upon other fields of scientific endeavor. Likewise, in education, pharmacy will not be a factor to be reckoned with unless we can make a contribution at least to the field of professional education.

In the beginning, the American Council on Education concerned itself only with education on the college level. As has already been said education on the college level is dependent directly upon secondary level education. The Council's

work was extended to include this. One of the outstanding problems in professional education has been to correlate its needs with education on the college level, or in other words the problem is professional education on the college level.

The needs of preprofessional education in medicine, dentistry, nursing, law and engineering are far from settled as evidenced by a request to the American Council on Education that came from Dr. W. D. Cutter of the American Medical Association for the formation of a forum for the discussion of the broader aspects of professional education. As a result, the Council called a conference on professional education which met in Washington in May with Dr. Raymond Walters, president of the University of Cincinnati as chairman. The Conference was attended by representatives of medicine, dentistry, pharmacy, law and engineering.

In the July 1937 number of the *American Journal of Pharmaceutical Education* is the report of that conference. In this conference the trend of the discussions were toward the finding out if there is something in education that is common to all the professions. Following along this trend it was decided that at the next conference the discussions should be directed by the suggestions in the following questions:

1. How far should a common preliminary education be required by all the professions?
2. How may the ethics of the professions be promoted?
3. How may universities be influenced in matters concerning professional education?

In the same *Journal* will also be found an article on "Trends in Professional Education," by Alphonse M. Schwitalla, dean of the School of Medicine of St. Louis University and president of the North Central Association of Colleges and Secondary Schools. This paper was read at the 1936 meeting of the American Council on Education and has furnished the basis of the discussions in the conference. It should be read by every individual interested in the future developments in pharmaceutical education.

THE TERM "NEW DRUG" UNDER THE FEDERAL FOOD, DRUG AND COSMETIC ACT.

The term means any drug the composition of which is that such drug is not generally recognized, among experts qualified by scientific training and experience to evaluate the safety of drugs, as safe for use under the conditions prescribed, recommended, or suggested in the labeling thereof except that such a drug not so recognized shall be deemed to be a "new drug" if at any time prior to the enactment of this Act it was subject to the Food and Drugs Act of June 30, 1906, as amended, and if at such time its labeling contained the same representations concerning the conditions of its use; or (2) any drug the composition of which is such that such drug, as a result of investigations to determine its safety for use under such conditions, has become so recognized, but which has not, otherwise than investigations, been used to a material extent or for a material time under such conditions.

Control is set up for drugs which are dangerous to health when taken in the dosage and with the frequency prescribed by the manufacturer in the labeling. Habit-forming potent drugs liable to be misused must bear label warnings against probable misuse. Special safeguards are set up for packaging and labeling deteriorating drugs. Antiseptics must possess germ-killing power.

PROCEEDINGS OF THE LOCAL BRANCHES

"All papers presented to the Association and Branches shall become the property of the Association with the understanding that they are not to be published in any other publication prior to their publication in those of the Association, except with the consent of the Council." —Part of Chapter VI, Article VI of the By-Laws.

ARTICLE III of Chapter VII reads: "The objects and aims of local branches of this Association shall be the same as set forth in ARTICLE I of the Constitution of this body, *and the acts of local branches shall in no way commit or bind this Association, and can only serve as recommendations to it.* And no local branch shall enact any article of Constitution or By-Law to conflict with the Constitution or By-Laws of this Association."

ARTICLE IV of Chapter VII reads: "Each local branch having not less than 50 dues-paid members of the Association, holding not less than six meetings annually with an attendance of not less than 9 members at each meeting, and the proceedings of which shall have been submitted to the JOURNAL for publication, may elect one representative to the House of Delegates."

Reports of the meeting of the Local Branches shall be mailed to the Editor on the day following the meeting, if possible. Minutes should be typewritten with wide spaces between the lines. Care should be taken to give proper names correctly and manuscript should be signed by the reporter. *Please advise us of changes in Roster and mail reports promptly.*

BALTIMORE.

The April meeting of the Baltimore Branch, A. PH. A., was held at the School of Pharmacy, U. of Md. The guest speaker was James J. Moran, of the Kimble Glass Co., Vineland, N. J. This was the first of a series of meetings at which it is proposed to have specialists in the production and distribution of various drug store supplies discuss these for the benefit of our members and friends. Several prominent firms are coöperating by furnishing able technical specialists and research men to address our group at this and succeeding meetings during 1938. This series of talks should prove both popular and profitable to the pharmacists of the city. Much useful information may be acquired by attending the several remaining meetings scheduled for this year.

ROBERT S. FUQUA, *Secretary.*

CHICAGO.

A total of 218 members, guests and friends of the Chicago Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION gathered at the Palmer House on Tuesday evening, March 15, 1938, to celebrate the 250th Meeting of the Branch. After an excellent dinner, President Emig presided over the program which presented the following ASSOCIATION members and officers: Immediate Past-President G. D. Beal, President E. N. Gathercoal, President-Elect J. Leon Lascoff and Secretary E. F. Kelly. These gentlemen all responded with greetings from their respective Local Branches and also for the parent Organization. Responses from F. E. Bibbins representing Indianapolis, Dr. Edward Kremers of Madison and F. W. Nitardy of Brooklyn were also on the program.

The principal speaker was Dr. Ernest Little, chairman of the Committee on Local and Student Branches of the AMERICAN PHARMACEUTICAL ASSOCIATION. Heartened by the presence of a large number of students (about 75 in all), Dr. Little pointed out the importance of Branch activities in coördinating the many phases of Pharmacy. Meeting here on a common ground of mutual interest in advancement of the profession of Pharmacy, the branches of the AMERICAN PHARMACEUTICAL ASSOCIATION can do much to further the attainment of desirable objectives. Summing up his discussion, Dr. Little pointed out the need for constant endeavor on the part of every person and the fact that through membership in the AMERICAN PHARMACEUTICAL ASSOCIATION much greater progress can be made, he climaxed his address with a fervent plea for all of the members to attempt to add one new member to the ASSOCIATION during the coming year.

Besides the officers and members of the branch, the following representatives of allied pharmaceutical organizations were present: Joe Shine, Secretary, and Mr. Arno Rheinhart, Treasurer of the Illinois Pharmaceutical Association; Joe Oberman, President, and Sam Reader,

Editor of the Chicago Retail Druggists' Association; Geo. Bender of the National Association of Retail Druggists; and Past-President of the A. PH. A. and Secretary of the National Association of Boards of Pharmacy, H. C. Christensen.

After the close of the formal meeting a general social period followed.

R. E. TERRY, *Secretary-Treasurer.*

MICHIGAN.

THE PRESCRIPTION SYMPOSIUM PROVES INTERESTING.

The March meeting of the Michigan Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION was held March 22, 1938, in the Wayne County Medical Society Building. The meeting was preceded by a dinner with twenty-five members enjoying the spirit of good fellowship that exists at these dinners.

The attendance reached about seventy-five when the meeting was called to order by Vice-President Robert Church of the University of Michigan. Another large delegation came down from Ann Arbor to attend the meeting. The College of Pharmacy was well represented by Dr. H. B. Lewis, Director of the College; Professors C. H. Stocking, C. C. Glover and J. L. Powers. They were supported by more than a dozen students. Mr. Harvey Whitney and his staff from the University Hospital completed the Ann Arbor group. The students of the College of Pharmacy of Wayne University also were on hand, twenty-five strong.

Dr. Howard B. Lewis of the University of Michigan, in behalf of the faculty of the College of Pharmacy, again extended an invitation to the members of the Michigan Branch to attend the Annual Pharmaceutical Conference to be held May 18, 1938. Dr. Lewis outlined the program which should be of interest to every pharmacist in the state. A large attendance is anticipated.

Mr. Church then introduced John Karagulis, of the Leonard A. Seltzer Pharmacy, who with Mr. R. L. McCabe led the Prescription Symposium. John H. Webster presented the corner drug store as an American institution as a service to the community.—(*To be continued.*)

Michigan Branch.—Program Committee, *Chairman,* Roland T. Lakey.

BERNARD A. BIALK, *Secretary.*

NEW YORK.

The regular meeting of the New York Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION was held on March 14, 1938, at the Columbia University, College of Pharmacy, New York City. President Canis presided and about one hundred members and guests were present.

The minutes of the previous meeting were approved as read.

Dr. Bilhuber reported that he had examined the books of the treasurer and stated that we had a balance of $280.71. He reported that we have not received the usual rebate from the parent association and suggested that the secretary inquire as to the reason for the delay.

F. Schaefer reported that the application for membership of Mr. Albert Seiler had been received.

Mr. Lehman read the report of the Committee on Education and Legislation.

Mr. Steiger presented the report of the Committee on the Progress of Pharmacy. Copy follows.

Dr. Hugo Schaefer announced that Henry C. Christensen had been elected as the Remington Medalist for 1938. Dr. Christensen is the eighteenth in a long line of distinguished men to receive this honor.

Letters were read from the New York Pharmaceutical Council announcing its Annual Convention to be held at the Hotel Pennsylvania on April 26th and 27th. Members were reminded that any resolutions they may wish to present should be sent to the Resolutions Committee prior to the convention.

A letter from the American Fair Trade League was read announcing a Victory Dinner and Mass Meeting at the Hotel Astor on April 4, 1938.

A letter from Dr. Ernest Little, chairman of the AMERICAN PHARMACEUTICAL ASSOCIATION Committee on Local and Student Branches, was read. He asks that the Branch start a campaign to increase membership in the ASSOCIATION. The matter was referred to the Membership Committee.

There being no further business the meeting turned to the Scientific Section and President Canis introduced Dr. J. A. Morrell of the Biological Laboratories of E. R. Squibb and Sons.

Dr. Morrell described the preparation, uses and action of the Estrogenic Hormones. A display of the Hormone Products of Squibb were shown.

A rising vote of thanks was accorded the speaker and the meeting adjourned.

HORACE T. F. GIVENS, *Secretary.*

REPORT OF THE COMMITTEE ON THE PROGRESS OF PHARMACY.

BY L. W. STEIGER, CHAIRMAN.

"A New Blood Pressure Raising Drug," by F. Avery Jones, *The Lancet* (Jan. 22, 1938), 195.

"An important phase in modern therapeutics has been the introduction of drugs chemically related to epinephrine and acetylcholine, and there are many variations on the two themes. A striking feature of these new drugs is the way in which they reproduce mainly one action of the parent substance. Carbaminoylcholine acts powerfully on the bladder and is used for the treatment of post-operative retention of the urine. Acetyl-β-methyl choline with its chief action on the heart, finds its application in paroxysmal tachycardia. Benzedrine, too, with its remarkable cerebral effects, is another example of this new group. . . ."

"The new compound (trimethoxy benzyl-dihydro-imido-azol-hydro-chloride) is a distant relative of epinephrine. In laboratory animals it was found to produce a prolonged elevation of the blood pressure. In man it appears to act predominately on the smooth muscle of the blood vessels and skin, producing a rise in blood pressure, pallor and goose-flesh. . . . Clinical trial has demonstrated its pressor effect. After injection there is a sharp rise in blood pressure, and then a gradual fall to the normal level. There is also a slowing of the pulse, which may outlast the corresponding rise in blood pressure."

"Treatment of Infected Wounds with Urea," by Leon F. Muldavin, *The Lancet.* (From the Lancet of March 5th.)

The Council on Pharmacy and Chemistry of the A. M. A. publishes a preliminary report on Allantoin in the current number of the *Journal* (3/12/38).

The subject of maggot therapy is reviewed, and mention is made of Robinson's discovery that allantoin seemed to be the principal secretion of maggots, responsible for the stimulation of healing in wounds. The article goes on to say that Allantoin is not a new remedy. Macalister in 1912 noted the use of comfrey root by the natives of rural England. They applied it to wounds for the purpose of promoting healing. Macalister had this agent analyzed. . . it contained from 0.8% to 0.9% allantoin. He noted that the people of England had used comfrey for many centuries, but no mention of it was made in any pharmacopœia available to him. . .subsequently it has been recognized in the British Pharmaceutical Codex as Symphytum. . . . .

Robinson later found that a substance derived from allantoin was probably responsible for its effectiveness. The product is urea. . .he found that urea was capable of stimulating healing in chronic purulent wounds and that there was a cleansing of the wound by removal of necrotic material and pyogenic bacteria. He believes that this healing action probably accounts in part, for the custom prevalent in the old world of using urine for the healing of wounds.

NORTHERN NEW JERSEY.

The Northern New Jersey Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION, at its regular meeting at Rutgers College of Pharmacy in Newark, N. J., on March 21st, elected the following officers for the ensuing year: *President*, Robert W. Rodman; *Vice-President*, Harold DeW. Goulden; *Treasurer*, Bernard Aaron; *Secretary*, Cyrus L. Cox.

Plans were discussed for the annual Physicians-Pharmacists' meeting to be held the third Monday of April.

Dr. O. P. M. Canis was the speaker of the evening and the topic was "Principles on Homeopathic Medicine." Dr. Canis gave a brief biographical sketch of Hahnemann and traced the principles underlying the homeopathic practice back as far as 400 B. C. The history of the growth and spread of the practice of this school of medicine and numerous examples illustrating the effectiveness of the medication were cited. Dr. Canis also indicated the chief differences between the pharmacy of the homeopath and that of the allopath.

CYRUS L. COX, *Secretary.*

NORTHERN OHIO.

The Northern Ohio Branch held its monthly dinner meeting at the Faculty Club of Western Reserve University, Cleveland, March 11th. In accordance with our rule that alternate meetings shall be addressed by members of our own group, President W. W. Hosler discussed some of the newer emulsifiers and absorption bases used in the manufacture of ointments and cosmetic creams.

The speaker, by virtue of his position as vice-president in charge of production of the Miller Wholesale Drug Co. (Miller Laboratories), Cleveland, was in a position to speak authoritatively and interestingly on the subject matter. Type preparations of the following were among those shown and discussed:

Triethanolamine and related preparations
Cetyl Alcohol and related preparations
Lecithin as an emulsifier
Cholesterol, oxycholesterol and related preparations
Glyceryl monostearate creams.

N. T. CHAMBERLIN, *Secretary.*

PHILADELPHIA.

FEBRUARY.

The February meeting of the Philadelphia Branch, AMERICAN PHARMACEUTICAL ASSOCIATION, was held on Tuesday evening, February 1st at the Philadelphia College of Pharmacy and Science. Vice-President Kerlin called the meeting to order.

The minutes of the January meeting were read and approved.

Mr. Simpson of the Membership Committee presented the name of E. M. Reese for associate membership in the Branch. Miss Reese was unanimously elected. Mr. Drain presented the name of Mr. George Lambert who was unanimously elected to membership pending approval of the parent body.

Dr. Eby reported that plans for the March meeting were under way. At this meeting we entertain the Past-Presidents of the branch and the visiting delegates to the Joint Meeting of Boards and Colleges of Pharmacy of District No. 2. This meeting will be held on Monday, March 7th.

The Treasurer's Annual Report was submitted with a certificate of audit by Dr. Eby. The report showed a balance in the checking account of $174.35 and $49.92 in the special segregated fund, as of the date December 31, 1937.

Vice-President Kerlin then called upon Dr. Adley Nichols who introduced the guest speaker, Dr. E. N. Gathercoal. Dr. Nichols spoke briefly about the many activities of the speaker and emphasized the present important work he is doing as chairman of the Committee on National Formulary and as president of the AMERICAN PHARMACEUTICAL ASSOCIATION.

Dr. Gathercoal in his address spoke of the greatly increased interest being shown in the National Formulary during the past several years. He stated that since the appearance of the N. F. VI hundreds of letters have been received by the Committee offering criticisms by pharmacists, teachers, Food and Drug Adm. officials, and manufacturers. This he contrasted with the 5 letters of criticism received from 1926–1929. Dr. Gathercoal expressed the belief that in the future it would be found impractical to adhere to the custom of decennial revision of the N. F., believing that the book would be in a continuous state of revision. He expressed gratitude for the coöperation that the Committee is receiving from manufacturers and many research workers in its present task of studying the many suggestions of change. An outline of the manner in which the monographs are being checked in the laboratory was presented in very interesting and instructive manner.

A rising vote of thanks was tendered the speaker at the close of his address.

ARTHUR K. LEBERKNIGHT, *Secretary.*

MARCH.

The annual meeting and dinner to Past-Presidents of the Philadelphia Branch, AMERICAN PHARMACEUTICAL ASSOCIATION, was held on *Monday evening, March 7th, at 7 o'clock P.M.* at the Benjamin Franklin Hotel, Ninth and Chestnut Streets.

In addition to the dinner customarily tendered to Past-Presidents, the visiting delegates to the Conference of State Boards and Colleges of Pharmacy of District No. 2 were entertained. This group has not met in Philadelphia since 1933 and it is hoped that you will come out and assist us in making their visit here a pleasant one.

Dr. C. H. Smeltzer, Associate Professor of Psychology at Temple University Teachers College, addressed the members and guests on the subject: "Some Problems Concerning State Board Examinations and Some Tentative Solutions." Dr. Smeltzer is a well-known teacher and writer in the field of educational Psychology and has had wide experience in the testing field.

Others who delivered addresses were the president of the National Association of Colleges of Pharmacy, the president of the National Association of Boards of Pharmacy, and the president-elect of the AMERICAN PHARMACEUTICAL ASSOCIATION.

ARTHUR K. LEBERKNIGHT, *Secretary.*

WASHINGTON BRANCH.

FEBRUARY.

The February meeting of the Washington Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION was held in the Museum of the INSTITUTE OF PHARMACY, in association with the Potomac Appalachian Trail Club. There were about 100 present.

Dr. T. S. Githens of the Mulford Biological Laboratories, Sharp and Dohme, Glen Olden, Pa., discussed the "Venomous Snakes of North America and the Problem of Snake Bite." The venomous snakes found in this country all belong to the pit-viper family except two species of Coral snake, found respectively in the south-east and south-west, and which hardly ever bite man or large animals. The pit-vipers include two moccasins, the upland moccasin or copperhead, found from New England to Florida and west to the western Mississippi basin, and the water moccasin or cotton-mouth found from Virginia to Florida and in the Gulf states; also two ground rattlers, of which the commoner, or pigmy rattler extends from Florida to Texas, while the massasauga ranges from Wisconsin and Michigan to western Texas. There are in addition about twenty kinds of true rattlesnakes, of which only five are important as biting man. The most widely distributed is the Timber rattler, which is found over much the same area as the copperhead. The Florida Diamondback rattler, our largest and most poisonous snake, extends over Florida and the adjacent states near the coast. The Texas Diamondback rattler, which is almost as large, is found in Texas and the adjacent states. North of this we find the Prairie rattler, in the plains states, and further west, especially common in the Sierras, is the Pacific rattler, extending from Canada to Mexico.

About 99% of the bites from these snakes occur on the limbs, generally below the knee or elbow. The Antivenin Institute of America, affiliated with the Mulford Biological Laboratories, has been collecting data on bites by poisonous snakes in the United States, for more than ten years. In one year upward of 600 such bites were reported and as it is believed that only about one-third of the actual bites were known to us, we estimate the actual number at from 1500 to 2000. Of this number, the copperhead probably accounts for about 500, the Texas Diamondback rattler for about 300, and most of the other species for 75 to 100 each. The mortality without adequate treatment ranges from 20–30% with the large Diamondback rattlesnakes, to less than 1% with the copperheads and ground-rattlers. If the antivenin is given in time, the mortality is about one-quarter of that in the group which did not receive the serum.

The symptoms following snake-bite are local swelling and pain with blood-stained effusion into the tissues and sometimes gangrene especially if a tight tourniquet is left too long. General symptoms include weakness, shortness of breath, weak pulse, faintness and often shock and collapse. Local treatment consists of a ligature or tourniquet placed above the wound and incisions over the fang marks and around the swelling to which suction is applied for about fifteen minutes out of each hour. Between suction the wound should be covered with a clean handkerchief or gauze soaked in a strong solution of salt or epsom salt or an antiseptic which does not precipitate proteins, such as S. T. 37. The antivenin is given as soon as possible, preferably intramuscularly above the tourniquet. Several syringes will generally be required if the snake is a large one or the victim a child.

Antivenin is prepared by hyperimmunizing horses to the venom, which is obtained from the snakes by hooking the fangs over the edge of a sterile conical glass and squeezing the poison sacs which are located on the sides of the head. The venom is centrifuged and dried and made into a solution which is sterilized by filtration and injected into carefully selected horses in increasing doses until antibodies appear in the blood in sufficient amount. The horse is then bled and the antivenin prepared from the serum by a special method of concentration, yielding a globulin. One antivenin, the North American Snake Bite Serum, is a polyvalent product effective against all the poisonous snakes of North America except the Coral Snakes. (See displays on Snake Bite and Serums, Medical Section, Smithsonian Institution.)

In closing, Dr. Githens stated that moccasin venom is used medicinally in checking tendency to hemorrhage and that an antivenin is being produced for the Black Widow Spider.

KENNETH L. KELLY, *Secretary.*

MARCH.

The March meeting of the Washington Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION was held on the 21st, in the Medical Section of the Smithsonian Institution.

Dr. F. L. Lewton, curator of the division of textiles of the National Museum, who is also responsible for the Division of Medicine, briefly traced the history of this section from the Centennial in Philadelphia in 1876. Much medical and pharmaceutical material shown at this exposition formed the nucleus of the comprehensive series of exhibits now at the Smithsonian. Dr. James Flint, a surgeon in the United States Navy, was detailed by the Navy Department to develop these collections at the Museum. Dr. Flint set as his first goal a complete illustration of every drug in the Pharmacopœia in all of its forms and with all of its adulterants, as well as the official drugs of other nations. This required the collection of about 10,000 specimens, an undertaking which was made possible through the close coöperation of the large drug houses. Exhibits were prepared for the Jamestown and Omaha Expositions which were later merged with the existing display. According to governmental statutes, specimens or exhibits prepared at government expense become the property of the United States Museum.

Soon after Dr. Flint's death, the curatorship was turned over to Dr. Lewton in 1914. Under his direction the sections on Pharmacy, Materia Medica, History of Medicine, and Public Health and Hygiene were established. A Medical and a Pharmaceutical library were founded, which have been richly endowed with contributions from authors as well as from schools and associations. Many of the exhibits, representing a large outlay of time and money, have been contributed by the large manufacturing houses in this country.

With these preliminary remarks, Dr. Lewton led the group around the hall explaining the significant points as set forth in each case.

One part of the gallery is devoted to the Section on the History of Medicine. The medical displays are divided into four classes: magic, psychic, physical and biological. Under the first, one sees a madstone which is a tightly wadded ball of hair taken from a deer or cow's stomach and is made up of the hair which the animal has licked off of itself. In the same case are amulets and good luck pieces such as rabbits' feet, carved wood, stone and glass charms and ornaments made of beads. Under the third heading, physical, you can follow the development of surgery from the leech and primitive blood-letting machines and medicines mentioned in the Bible to a display of the most modern forms in which medicines are packaged. In between are displays of homeopathy, osteopathy, dentistry; eclectic medicine, as advocated by Dr. John Uri Lloyd; a display of queer patent models, including one to give a patient a pill without his knowledge or a trap to catch intestinal worms; an exhibit to illustrate the composition of the human body, stills for essential oils and pill machines.

A complete display of sera and immunology comprises the fourth section. This exhibit is the outcome of Dr. Lewton's frantic search for information on seriology to save the life of his little daughter. Now one can follow the manufacture, standardization and administration of sera for snake-bite, pneumonia, diphtheria, meningitis, etc.

After the meeting Dr. Lewton was kind enough to answer many questions put forward by the group. The various members expressed a desire to return and study the exhibits at their leisure.

KENNETH L. KELLY, *Secretary.*

PROGRAM OF TEACHERS' CONFERENCE IN MINNEAPOLIS.

At the 1937 New York meeting of the Conference of Teachers of Pharmacognosy and Pharmacology of the A. A. C. P., Dean Lemon suggested that the officers for the coming year depart from the custom of planning a program consisting of a long list of formal papers, and substitute for this a *round table* discussion of some problem of general importance. He mentioned that laboratory teaching of pharmacology might be of interest. It was the pleasure of the gathering that this type of program be arranged for the Minneapolis meeting this summer.

Accordingly, here is our plan for the Minneapolis meeting of the C. T. of P. & P.

Subject A.—Teaching of the Laboratory Course in Pharmacognosy. *Leaders of Discussion:* Professors Ralph Bienfang, L. D. Darbaker, Heber W. Youngken and (we hope) Wm. J. Bonisteel.

Subject B.—Teaching of the Laboratory Course in Pharmacology. *Leaders of Discussion:* Professors B. V. Christensen, J. M. Dille, J. C. Munch and Arno Viehoever.

It was thought advisable to include both the laboratory teaching of pharmacognosy and pharmacology in our program since we have some members who are interested primarily in one or the other, and also some members who are interested in both.

Based on time consumed at previous meetings, we shall have approximately $1^1/_2$ hours for each subject. Since each leader of discussion has been requested to limit the time for his remarks to ten minutes or less, it will give us almost an hour of round-table discussion for *each* subject.

We are fortunate in having as discussion leaders capable speakers who not only will be able to contribute abundantly from their wealth of experience but also whose individual approach to their subject has often been from different directions.

The success of our meeting in large part, however, will depend on each one of us. We want each member to come prepared to join in the general discussion, to submit his own problems, and to add his bit to the solution of other members' questions. If we merely sit back and allow the leaders to do all the work, then the program will not be very different from the usual formal approach.

Between now and C. T. of P. &. P. time in Minneapolis next summer, won't you find opportunity to make a list of the more important of your own problems in the teaching of the pharmacognosy or pharmacology laboratory or both, and come to the meeting prepared to bring these before the group?

All of us may hope to carry away with us valuable suggestions for our own teaching, and an added appreciation of the other fellow's viewpoint.

After the meeting, we hope to submit a copy of the entire program—talks by the leaders and the following discussions—to Prof. Zada Cooper, Secretary of the A. A. C. P., under the title "Contributions from the Conference of Teachers of Pharmacognosy and Pharmacology, Minneapolis, 1938." Expressions of opinion and suggestions are invited.

MARIN S. DUNN.

STATE UNIVERSITY OF IOWA.

A Prescription Symposium under the direction of the College of Pharmacy was held March 25th. Thirty Iowa pharmacists from various sections of the state discussed ten subjects pertaining to the prescription laboratory of a drug store.

The symposium was the first affair of its kind under the direction of the College of Pharmacy and was designed as a practical aid to Iowa Pharmacists.

Organization of The Iowa Academy of Pharmacy was completed at the close of the program with the election of officers, the adoption of a constitution and by-laws and the awarding of fellowships.

The objectives of The Iowa Academy of Pharmacy are: to promote prescription and dispensing service to the public; to promote the ideals and ethics of professional pharmacy; to advance the standards and efficiency of pharmacy; to improve public understanding and appreciation of pharmacy as a branch of public health service.

Fellowships are to be awarded by the Academy to those Iowa pharmacists who contribute to the programs of the Academy. They may also be awarded to Iowa pharmacists for other eminent service in advancing professional pharmacy or furthering its public appreciation.

ASSOCIATION BUSINESS

AD INTERIM BUSINESS OF THE COUNCIL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION, 1937–1938.

Office of the Secretary, 2215 Constitution Avenue, Washington, D. C.

LETTER NO. 7.

April 14, 1938.

To the Members of the Council:

43. Contract for the Publication and Distribution of the Journal for 1938. Motion No. 14 (Council Letter No. 6, page 161) was carried and the contract was awarded.

44. Use of the Text of N. F. VI. Motion No. 15 (Council Letter No. 6, page 161) was carried and P. Blakiston's Son & Co. were so advised.

The following communications have been received from Chairman DuMez of the Committee on Publications:

"It is recommended that permission be granted to Professor C. D. Leake of the Medical School of the University of California to use portions of the text of the N. F. VI for descriptive purposes in the 'Booklet of Drugs and Chemicals' maintained for the staff members and students of that institution and that no charge be made for this grant."

"It is recommended that permission be granted to Dr. E. M. K. Geiling of the University of Chicago to use portions of the text of the N. F. VI in the preparation of course material for prescription writing. Since this manual is not to be used for public sale, it is further recommended that no charge be made for the grant."

(*Motion No. 17*) It is moved by DuMez that Professor C. D. Leake and Dr. E. M. K. Geiling be granted permission to use the text of the N. F. VI as recommended with the customary acknowledgment and for value received.

45. Election of Members. Motion No. 16 (Council Letter No. 6, page 162) was carried and applicants for membership numbered 168 to 213, inclusive, were declared elected.

46. Report of the Auditor. Mr. W. A. Johnson, Certified Public Accountant, has submitted the following report:

"I have made an examination of the books and accounts of the AMERICAN PHARMACEUTICAL ASSOCIATION and of your report, as Treasurer, for the calendar year 1937, and I hereby certify that the total cash and securities on hand at December 31, 1937, amounting to $240,484.51 is correctly stated.

"All cash receipts have been traced to deposits in banks to the credit of the respective funds for which received, and all disbursements have been found evidenced by properly authorized voucher checks.

"Cash on deposit has been reconciled with statements submitted by the banks as of the close of the year or verified by comparison with certificates of deposit.

"Investment securities, having a face or par value of $178,100 have been verified by examination of the bonds or certificates. United States Treasury 2¾% certificates in the amount of $40,000 were purchased during the year for the account of the following Funds:

Endowment Fund.....	$2500.00	Research Fund.....	$28,000.00
Centennial Fund.....	1000.00	Procter Monument Fund	2,500.00
Ebert Legacy Fund.....	1500.00	F. B. Kilmer Fund.....	3,000.00
Life Membership Fund...	1500.00		

"Interest accruing on registered bonds and on coupons attached to other bonds have been properly accounted for on your report and have been deposited to the credit of the proper accounts in the depositories of the ASSOCIATION. Interest on 1000 City of Detroit, Michigan 4% bonds which was in arrear at the beginning of 1937 has been collected.

"Records maintained by the Secretary of the ASSOCIATION have been examined and transfers of funds from his account to that of the Treasurer have been verified and found to be correctly stated."

The Treasurer's Report for 1937, which includes the following summary, will later be published in full:

COMPARISON OF FUNDS.

	Dec. 31, 1936.	Dec. 31, 1937.
Current Fund:		
Deposit in Merchants & Newark Trust Co	$ 30,793.43	$ 2,490.27
Deposit in Boston Penny Savings Bank	430.43	.....
Deposit in Baltimore Trust Company	1,536.20	1,331.37
Deposit in Baltimore National Bank	.....	4,745.25
Total Current Funds	$ 32,760.06	$ 8,566.89
Permanent Funds:		
Endowment Fund	$ 17,773.14	$ 18,280.69
Centennial Fund	6,242.99	6,398.49
Fbert Legacy Fund	9,227.63	9,555.58
Ebert Prize Fund	1,054.67	1,033.34
Life Membership Fund	34,133.31	34,552.51
Endowed Membership Fund	129.05	129.05
Research Fund	69,040.98	92,263.73
Headquarters Building Fund	560,946.99	584,696.72
Total Permanent Funds	$698,548.76	$746,910.11
Trust Funds:		
Procter Monument Fund	$ 19,073.28	$ 19,686.64
Remington Honor Medal Fund	1,343.64	1,355.16
F. B. Kilmer Fund	3,000.00	3,041.25
Total Trust Funds	$ 23,416.92	$ 24,083.05
Summary of Funds:		
Current Fund	$ 32,760.06	$ 8,566.89
Permanent Funds	698,548.76	746,910.11
Trust Funds	23,416.92	24,083.05
Total Funds	$754,725.74	$779,560.05

SUMMARY OF ASSETS AND TRUST FUNDS.

	Dec. 31, 1934.	Dec. 31, 1935.	Dec. 31, 1936.	Dec. 31, 1937.
Current Fund	$ 4,196.01	$ 2,823.87	$ 32,760.06	$ 8,566.89
Permanent Funds	680,507.27	688,369.23	698,548.76	746,910.11
Total Assets	$684,703.28	$691,193.10	$731,308.82	$755,477.00
Trust Funds	19,214.15	19,819.02	23,416.92	24,083.05
Total	$703,917.43	$711,012.12	$754,725.74	$779,560.05

SUMMARY OF DEPOSITS, SECURITIES AND PROPERTY.

Deposit in Baltimore National Bank	$ 9,334.66	
Deposit in Merchants & Newark Trust Co	2,490.27	
Deposit in Baltimore Trust Co	5,138.40	
Deposit in Maryland Trust Co	45,421.18	
Securities in Baltimore National Bank	178,100.00	
Property in Washington, D. C	539,075.54	
Total Deposits, Securities and Property, December 31, 1937		$779,560.05

47. Loyola University Student Branch. The following application has been received together with the applications for membership and the dues for 1938:

"The following students of the New Orleans College of Pharmacy, Loyola University, desire to establish a Student Branch at the College and petition the Council of the ASSOCIATION to approve the formation of the Branch and its Preamble and Constitution as submitted herewith:

Leo Joseph Babin	June L. Ware	Wilbur A. Daspit
John Frank Thompson	Marie R. M. Poche	Milburn Peter Gauthier
Eugene Joseph Ayo	James D. Vinci	Marcia Freida Heiman
Hyacinth A. Blanchard	Paul V. Poche	Thomas Benton Landry
Estelle Glaviano	Rose Randazzo	William R. Hutchinson, Jr.
Edith Sterbcow	Louis P. Muller	Nicholas C. Montalbano
Louis A. Wilson	Joseph F. Ernst	Helen Rita Pitre
Harold Richmond	Elsie R. Strain	Josephine Ramoneda
John Giordano	J. S. E. Gary	Maurice J. Schaefer
Rosalie Centanni	Robert G. Bienvenu	James C. Decuers
	Clyde D. Simmons	

President, Leo J. Babin; *Vice-President*, John F. Thompson; *Recording Secretary*, Marcia Heiman; *Corresponding Secretary*, Louis P. Muller; *Treasurer*, Rosalie Centanni; *Faculty Advisor*, Dean John F. McCloskey.

CONSTITUTION OF THE LOYOLA UNIVERSITY STUDENT BRANCH.

PREAMBLE. We, students in the Pharmaceutical Profession, will earnestly strive to do our best in all undertakings of this organization. This branch, representative of the AMERICAN PHARMACEUTICAL ASSOCIATION whose movements shall be fostered, seeks as its ultimate goal due recognition and the elevation of the standards and practice of the Profession of Pharmacy.

ARTICLE I. *Name.* The name of this organization shall be the Student Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION in the New Orleans College of Pharmacy at Loyola University of the South.

ARTICLE II. *Objects and Purposes.* Section 1. To stimulate an interest in Pharmacy and enlighten the public of the fact that Pharmacy is a Profession.

Section 2. To keep abreast of the scientific developments and progress in the profession of Pharmacy and to disseminate this information wherever possible.

Section 3. To foster a mutual relationship between Pharmacists, Physicians and allied professions.

Section 4. To maintain friendly relations among the members of our College, other campus organizations and the general student body of Loyola.

Section 5. To observe the traditions and uphold the standards of Loyola University in all our undertakings.

ARTICLE III. *Membership.* Section 1. All bona fide students in the College of Pharmacy are eligible for membership in this branch.

Section 2. Annually, this organization shall confer suitable honors upon two seniors who have been most active in this organization during their stay in school.

ARTICLE IV. *Officers.* Section 1. The officers of this organization shall be a President, a Vice-President, a Recording Secretary, a Corresponding Secretary and a Treasurer.

Section 2. They shall be elected annually and shall hold office until the installation of their successors.

Section 3. A member of the College of Pharmacy Faculty will serve as Faculty Advisor.

ARTICLE V. *Committees.* Section 1. The standing committees of this organization shall be: an Executive Committee; a Membership Committee; a Publicity Committee; and a Program Committee.

Section 2. The Executive Committee shall consist of the officers of this organization; the President serving as chairman.

Section 3. Other Committees shall consist of a chairman and not less than three members, appointed by the President.

ARTICLE VI. *Fiscal Year.* Section 1. The fiscal year shall be from January 1st through December 31st.

ARTICLE VII. *Amendments.* Section 1. An amendment of any article in this constitution will be made only when voted upon at a meeting and favored by a two-thirds majority of the members present.

Section 2. No amendment shall be considered if it conflicts with the policy of the AMERICAN PHARMACEUTICAL ASSOCIATION governing student branches.

(*Motion No. 18*) It is moved by Kelly that the application for the establishment of the Loyola University Student Branch and the Preamble and Constitution as submitted be approved.

48. Life Members. The following have become Life Members by payment of dues for thirty-seven consecutive years: V. Chapin Daggett, W. J. Teeters, W. T. Hankey, C. E. Caspari, W. W. Horne, Alfred P. Cook, Harry Placak, Willard Graham, Joseph F. Dulaney, Harry F. Ruhl, Richard L. Quigley, Howard D. Brewer and George H. P. Lichthardt; and the following through payment of other amounts as specified in the By-Laws: Adolph Ziefle, Charles W. Ballard, Frank O. Taylor and M. A. Baum.

49. Applicants for Membership. The following applications, properly endorsed and accompanied by the first year's dues, have been received:

No. 214, Kiyoshi Shiroyama, Box 683, Pullman, Wash.; No. 215, Arthur J. Anderson, Route No. 1, Pullman, Wash.; No. 216, Richard H. Grenfell, 1607 Opal St., Pullman, Wash.; No. 217, Robert K. Atkinson, 521 N. Atlantic, Alhambra, Calif.; No. 218, Mannie Carl Smith, 1502½ W. Adams, Los Angeles, Calif.; No. 219, Thelma Glick, 309 Margaret St., Jeannette, Pa.; No. 220, Herman E. Blank, 20 Second St., Dravosburg, Pa.; No. 221, George P. Hager, 3307 White Ave., Baltimore, Md.; No. 222, J. Carlton Wich, 3708 Calloway Ave., Baltimore, Md.; No. 223, Sister Mary Catherine, Mercy Hospital, Iowa City, Iowa; No. 224, Thea Elida Larson, University Hospital, Iowa City, Iowa; No. 225, Howard R. Adams, 5729 Milentz, St. Louis, Mo.; No. 226, Edgar E. Craig, 838 N. Biltmore, Clayton, Mo.; No. 227, Leo Joseph Babin, c/o Tulane Athletic Council, New Orleans, La.; No. 228, John F. Thompson, 1010 LeBoeuf St., Algiers, La.; No. 229, Eugene Joseph Ayo, Lockport, La.; No. 230, Hyacinth Anna Blanchard, 1300 Franklin Ave., McDonoghville, La.; No. 231, Estelle Glaviano, 806 Esplanade Ave., New Orleans, La.; No. 232, Edith Sterbcow, 3906 Magazine St., New Orleans, La.; No. 233, Louis A. Wilson, 6042 Magazine St., New Orleans, La.; No. 234, Harold M. Richmond, 4000 Baronne St., New Orleans, La.; No. 235, John C. Giordano, 4143 de Hemecourt St., New Orleans, La.; No. 236, Rosalie L. Centanni, Third & Butler Sts., Kenner, La.; No. 237, June Lois Ware, 2935 Paris Ave., New Orleans, La.; No. 238, Marie Rosa Mae Poche, Box 205, Lutcher, La.; No. 239, James D. Vinci, St. Francisville, La.; No. 240, Paul V. Poche, Box 205, Lutcher, La.; No. 241, Rose Randazzo, 3601 Banks St., New Orleans, La.; No. 242, Louis Paul Muller, 6325 Loyola St., New Orleans, La.; No. 243, Joseph Francis Ernst, 1519 Carondelet St., New Orleans, La.; No. 244, Elsie Rosevella Strain, Box 234, Abita Springs, La.; No. 245, Joseph Sidney E. Gary, 222 Center St., New Iberia, La.; No. 246, Robert Gerard Bienvenu, St. Martinville, La.; No. 247, Wilbur Adrian Daspit, St. Martinville, La.; No. 248, Milburn Peter Gauthier, Route No. 3, Bunkie, La.; No. 249, Marcia Freida Heiman, 303 Independence St., Covington, La.; No. 250, Thomas Benton Landry, Gonzales, La.; No. 251, William Richard Hutchinson, Jr., 5912 Catina St., New Orleans La.; No. 252, Nicholas Carl Montlbano, 317 Montague St., Rockford, Ill.; No. 253, Helen Rita Pitre, 2820 Esplanade, New Orleans, La.; No. 254, Josephine Ramoneda, 1206 Louisiana Ave., New Orleans, La.; No. 255, Maurice John Schaefer, 221—12 St., Cairo, Ill.; No. 256, James Conrad Decuers, 374 Sala Ave., Westwego, La.; No. 257, Clyde Douglas Simmons, R. F. D., Magnolia, Miss.; No. 258, Jesse Leroy Owens, Y. M. C. A., Waukegan, Ill.; No. 259, Edward J. Byard, 436 S. Chestnut St., Clarksburg, W. Va.; No. 260, Frederick P. McNess, Furst-McNess Co., Freeport, Ill.; No. 261, Walter S. Nicklin, Geo. Mason Hotel, Alexandria, Va.; No. 262, John Ralph Ellington, Jefferson, Ga.; No. 263, Elizabeth Carolyn Adams, Front St. & Lehigh Ave., Philadelphia, Pa.; No. 264, Sister Mary Stephanina, St. Elizabeth Hospital, La Fayette, Ind.; No. 265, Agnes M. Vetter, Penn & West St., Wilkinsburg, Pa.; No. 266, Sister Agatha Flynn, Mary's Help Hospital, San Francisco, Calif.; No. 267, Frederick P. P. von Keller, 1023 12th Ave., N. W., Ardmore, Okla.; No. 268, Sister Mary Mark, St. Vincent Hospital, Worcester, Mass.; No. 269, Sister Mary Hiltrudis Chlebik, 1015 O'Connor Ave., La Salle, Ill.; No. 270, Clarence B. Schuh, 822 S. 2nd St., San Jose, Calif.; No. 271, John Shostak, 1 Indian Ave., Bridgeport, Conn.; No. 272, Roland C. Pittsinger, 832 Bedford St., Stamford, Conn.; No. 273, Frederick Wm. Lasowsky, 121 Bedford St., Hartford, Conn.; No. 274, Irving Parker Gammon, Jr., 1363

Beacon St., Brookline, Mass.; No. 275, Samuel Heller, 375 Jay St., Brooklyn, N. Y.; No. 276, Jennings Murphy, 625 No. Milwaukee St., Milwaukee, Wis.; No. 277, Sister Schosastica Rodgers, Providence Hospital, Detroit, Mich.; No. 278, Charles H. Becker, Pharmacy Dept., Gainesville, Fla.; No. 279, Madison Burgin Duncan, 124 S. Main St., Versailles, Ky.; No. 280, Henry G. Parker, 105 College Ave., New Brunswick, N. J.; No. 281, Anthony Torind Frascati, 135 Fifth Ave., New York, N. Y.; No. 282, Walter C. Gakenheimer, 35 Overbrook Road, Catonsville, Md.; No. 283, Lloyd McClain Parks, Univ. of Wis., Madison, Wis.; No. 284, Josephine B. Scaletta, 1445 N. Lawler Ave., Chicago, Ill.; No. 285, Albert Seiler, 31–18 87th St., Jackson Hghts., New York; No. 286, Esther Meyer, 7533 Essex Ave., Chicago, Ill.; No. 287, Ralph Robertson, North Pacific College, Portland, Ore.; No. 288, Ernest M. Wilson, 822 N. E. Hancock St., Portland, Ore.; No. 289, Herman R. Scherzer, 461 So. 14th St., Newark, N. J.; No. 290, Newton Vere Sanders, 228 S. Broadway, Albert Lea, Minn.; No. 291, Joseph A. Lubitz, 36 Whalley Ave., New Haven, Conn.; No. 292, Antoinette E. Szczytkowski, 996 Ida St., Cleveland, Ohio; No. 293, Celestino Garcia Marales, Hotel Nueva Isla, Havana, Cuba; No. 294, Isidor L. Sommer, 589 Metropolitan Ave., Brooklyn, N. Y.; No. 295, James J. Sonnenberg, 127 W. Hadley St., Milwaukee, Wis.; No. 296, Vincent Kenjoski, 2911 Arthur St., N. E., Minneapolis, Minn.; No. 297, Sidney I. Shom, 519 8th Ave., So., South St. Paul, Minn.; No. 298 John Miller, Huron Road Hospital, Cleveland, Ohio; No. 299, Bernard F. Duwel, U. S. Naval Medical Supply Depot, Brooklyn, N. Y.; No. 300, John W. Holahan, 33–46 70th St., Jackson Heights, N. Y.; No. 301, Edward Staloff, 652 W. 189th St., New York, N. Y.; No. 302, Joseph Gurskis, 4327 S. Washtenaw, Chicago, Ill.; No. 303, Roy Childrey, 3322 Grove Ave., Richmond, Va.; No. 304, Melvin E. Welford, P. O. Box No. 175, University, Miss.; No. 305, Lothar August Krause, McGregor, Texas; No. 306, V. L. Jirasek, 102 State St., Harbor Beach, Mich.; No. 307, Samuel Gutchin, 551 Euclid Ave., Brooklyn, N. Y.; No. 308, Sister Mary Patricia Schmidley, 1536 Papin St., St. Louis, Mo.; No. 309, John Anthony Raudonis, 236 N. Fulton Ave., Baltimore, Md.; No. 310, Francis F. Millikan, 100 Bay Ridge Ave., Brooklyn, N. Y.; No. 311, Sister Anne Gallagher, 6337 So. Harvard Ave., Chicago, Ill.; No. 312, Ignatius Joseph Kaski, 715 S. Wood St., Chicago, Ill.; No. 313, Wm. Edgar Richardson, 107 Lafayette Rd., Audubon, N. J.; No. 314, Benedicta Leone Ginkiewicz, 4771 Tacony St., Philadelphia, Pa.; No. 315, Milton L. Neuroth, 327 W. University, Ada, Ohio; No. 316, Royal L. Carter, 5937 N. Paulina St., Chicago, Ill.; No. 317, Wayne Franklin Le Gore, 734 Division St., Webster City, Iowa; No. 318, Bernard L. Blumberg, 115 W. 68th St., New York, N. Y.; No. 319, Bernard Levenson, 251 W. 89th St., New York, N. Y.; No. 320, Harvey E. Sayles, S. E. Massengill Co., Bristol, Tenn.; No. 321, Wm. Henry Norton, 601 W. 168th St., New York, N. Y.; No. 322, Bernadette Giguere, Leila Hospital, Battle Creek, Mich.; No. 323, Herman J. Amsterdam, 115 W. 68th St., New York, N. Y.; No. 324, Philo Burrin, 5757 N. Delaware, Indianapolis, Ind.; No. 325, Milton A. Vaughn, 1002 State St., Bowling Green, Ky.; No. 326, Clarence B. Davis, First & Breckenridge, Louisville, Ky.; No. 327, Clyde David Holloway, 19 Fessenden Road, Arlington, Mass.; No. 328, Parker H. Heath, 410 Morgan St., Decatur, Ill.; No. 329, Raymond F. Burst, 533 Penn, Jackson, Miss.; No. 330, Norbert Julian Arth, 1731 W. Main St., Fort Wayne, Ind.; No. 331, Albert F. Morgenthaler, 1132 E. Cottman St., Philadelphia, Pa.; No. 332, Howard E. Christafferson, Neenah, Wis.; No. 333, Earl A. Keeney, 1682 S. E. Tenino, Portland, Ore.; No. 334, George Bruns, 218—8th Ave., New York, N. Y.; No. 335, Julian Joseph Romane, 1100 N. Pauliana St., Chicago, Ill.; No. 336, Daniel Francis Diffley, 22 Concord Ave., Cambridge, Mass.; No. 337, Edward Flavelle Koss, 3712 Harrison St., N. W., Washington, D. C.; No. 338, Nicholas Gesoalde, 395 Graham Ave., Brooklyn, N. Y.

(*Motion No. 19*) Vote on applications for membership in the AMERICAN PHARMACEUTICAL ASSOCIATION.

E. F. KELLY, *Secretary*.

National Air Mail Week—May 15th–21st—National Headquarters, Charlotte, N. C. An address by Postmaster James A. Farley from New York will emphasize the rapid progress in the preparations.

EDITORIAL NOTES

NATIONAL FIRST AID WEEK.

The 17th observance of National First Aid Week suggests an opportunity for relief in case of accidents until the doctor comes, and acquaints the public with the dangers of infection and delay and that cleanliness is essential. Whatever is done in case of accidents should be backed by good judgment. Accidents occur and vacations should be undertaken with a thought—on such possibilities and sudden illness.

In 1928 the Surgeon General, United States Public Health Service, prepared a Bulletin on *First Aid Methods for Treating the Injured*—see JOURNAL A. PH. A., July 1928, pages 699–701. It may be possible to obtain copies of the *Bulletin* from the Public Health Service, Washington, D. C.

THE PHARMACEUTICAL SYLLABUS, SECOND AND THIRD EDITIONS.

The Syllabus Committee has a number of copies of the Second and Third Editions of the Pharmaceutical Syllabus which it would like to dispose of. Any person or school desiring a copy in order to complete the series published to date may have these editions by sending twenty-five cents per copy to cover the cost of packaging and mailing.

HENRY M. BURLAGE, *Chairman*,
Chapel Hill, North Carolina.

INSTRUCTORS OF PHARMACEUTICAL CHEMISTRY.

It is urgently requested that the names of prominent instructors of the staff of the Chemistry department be forwarded to the secretary of the section, in order that these men may be solicited by personal letter for a paper for our program.

The presentation of chemistry in the University Schools is probably as it should be, but their association with our group may be helpful to all concerned.

GORDON A. BERGY,
Morgantown, West Virginia.

SMITHSONIAN GALLERY APPROVED.

The Library Committee of the House of Representatives has voted a favorable report on a joint resolution to set aside a site on the Mall at Washington for the proposed Smithsonian Gallery of Art. This gallery would house contemporary painting and sculpture and decorative arts such as furniture, glassware, porcelain and tapestry, including collections now in storage in the U. S. National Museum. The proposal is that the Government provide the site and maintain the gallery, and that private contributions be sought for constructing the building. Sites being considered are the area now occupied by Department of Agriculture greenhouses on the north side of the Mall, facing Constitution Ave., between 12th and 14th Streets, and on the south side of the Mall opposite the new gallery given to the Government by Andrew W. Mellon.

MORRISTOWN OPENS MUSEUM TO THE PUBLIC.

The Historical Museum at Morristown National Historical Park, Morristown, N. J., was formally opened to the public February 22nd, with an attendance of 2600 for the day. The Washington Association of New Jersey, donor of the Ford Mansion and much of the museum's material, held its annual meeting at the museum.

W. P. A. COÖPERATION.

Statistics compiled by the W. P. A. show that during the past year 2774 W. P. A. workers assisted museums in twenty-three states and the District of Columbia in classification, mounting specimens, cataloging, filing, typing manuscripts and records, and general clerical work. The figures are for October 31, 1937, and do not include men employed in construction of museum buildings.

PHILADELPHIA COLLEGE PUBLIC SCIENCE LECTURES.

The eighteenth annual series of popular science lectures are now in progress at the Philadelphia College of Pharmacy and Science. The lectures are held each Wednesday evening from March to May. Speakers are members of the faculty of the Philadelphia College. In most instances, their lectures are illustrated with experiments, demonstrations, motion picture films and still pictures.

HOSPITAL SERVICE—1937.

The Journal A. M. A., referring to its hospital number, states that "the admirable coöperation of hospital superintendents, medical directors and many others has made possible this annual census of hospitals. Official re-

ports have been received from 97.6 per cent of the hospitals, which represent 99.4 per cent of the total capacity of all registered hospitals. The 954 hospitals approved for internships and residencies made a 100 per cent response to the request for information.

"For twenty-nine successive years the hospital facilities of the United States have been enhanced each year by a net increase of between 20,000 and 30,000 beds. This year the increase was 27,827. This does not include rebuilding, replacements, repairs or expansion of scientific or administrative quarters. It is a net permanent addition to the capacity for accommodating additional patients."

The entire January 1938 issue of the *American Journal of Pharmacy*, published here, is devoted to a tribute to Charles Herbert LaWall, late dean of the Philadelphia College of Pharmacy and Science. The issue contains tributes from fellow workers as well as excerpts from Dr. LaWall's numerous writings on pharmacy.

JOHNS HOPKINS RALLY GRADUATES FOR CELEBRATION.

Johns Hopkins University will invite four thousand alumni back to its campus for April 30th, alumni day. Continuance of the innovation in future years will be determined by the success of this celebration.

The purpose, according to Dr. Mark Secrist, chairman of the program committee, is to restore interest of the alumni in their alma mater.

The *Journal of the New Orleans College of Pharmacy*, Loyola University, in its edition for 1938 gives honorable mention to the AMERICAN PHARMACEUTICAL ASSOCIATION for its service to Pharmacy and to its health contribution, stressing in particular the efforts of the ASSOCIATION to bring about the Food and Drug Law. It is hoped that the law will be enacted before the Congress adjourns. The *Journal* also referred to the work that the A. PH. A. is doing in association with Health Service bodies and organizations.

In this connection and narcotic legislation, pharmacists are always ready to do their part.

Seventh Annual Pharmaceutical Conference of the University of Michigan.—The Seventh Annual Pharmaceutical Conference of the College of Pharmacy of the University of Michigan will be held on Wednesday, May 18th, in the Michigan Union, under the chairmanship of Howard B. Lewis, Director of the College of Pharmacy. The 1938 Conference will center its program around legislation which affects pharmacy and the control of drugs. An unusually interesting program has been prepared. A special invitation to all interested in the advancement of pharmacy is extended for the Conference.

A large attendance of alumni, students in pharmacy and pharmacists in the state, is anticipated. A cordial invitation is extended to all who are interested in Pharmacy.

GERMAN APOTHECARIES MEET.

Invitation has been extended to American Pharmacists to attend the German "Apotheken Tag." An elaborate program has been arranged and the sessions will be held at Frankfurt *a. M.*, May 28th–31st. Social and Memorial hours will be held with sessions devoted to the several divisions of pharmacy.

The program includes a tour through the scenic sections, taking in the Oden Forests, Hanau, Enbach, Eberbach and Heidelberg; the return trip will differ in type of scenery from that going. A special effort is directed to bring visitors to Germany from various countries, and a welcome is assured.

PERSONAL AND NEWS ITEMS.

Dr. Frederick Johnson, son of Dean C. W. Johnson, University of Washington, College of Pharmacy, Seattle, has accepted a fellowship at the Mellon Institute of Industrial Research, under Dr. George D. Beal.

The will of the late Mrs. Ida Schultz Dohme has been filed in the Orphans Court of Baltimore, Md. She was the widow of Charles E. Dohme and the mother of Dr. A. R. L. Dohme. At the time of her death she was ninety-six years old. During early years Mrs. Dohme was a frequent visitor at the annual meetings of the AMERICAN PHARMACEUTICAL ASSOCIATION. The inventory valued the estate above $1,600,000.

We are indebted to **Dr. Arno Viehoever** for a twenty-six page reprint on "Evaluation of Aloe," reprinted from the *American Journal of Pharmacy*, and presented before the Drug Section of the Association of Official Agricultural Chemists, Washington, D. C. The experimental work was supported by the Board of Trustees, U. S. P.

Dr. Viehoever also presented a reprint on "Biochemistry of Amygdalin." The co-author is Harry Mack. This was presented before the American Association for the Advancement of Science, Pittsburgh meeting.

AMERICAN CHEMICAL SOCIETY.

The American Chemical Society will hold its sessions in Dallas, Texas, April 18th–22nd. The division of Medicinal Chemistry holds its session on Wednesday, April 20th. Dr. George D. Beal is the chairman and Walter H. Hartung the secretary. There will be a Joint Symposium on Vitamins, with the divisions of agricultural, food and biological chemistry; and a Joint Session with divisions of agricultural, food and biological chemistry, at which time Dr. Abraham White of Yale University will make the address and receive the Eli Lilly & Co. award in Biological Chemistry for 1938. Dr. I. M. Kolthoff will also preside on Wednesday.

H. C. Christensen has been named Remington Medalist for 1938. Because of his effective work in the National Association of Boards of Pharmacy, his valuable work in conducting the historical exhibits, etc., in Chicago and Dallas, he was deemed worthy of the high honor. A sketch will be published in the JOURNAL when the official award is made.

President E. N. Gathercoal and **Secretary E. F. Kelly** will attend the Minnesota Pharmaceutical Association as guests. The visitors will also receive plans of the arrangements made for the Annual Meeting of the AMERICAN PHARMACEUTICAL ASSOCIATION, to be held in Minneapolis, Minn., the convention city.

William Mair, *Honorary Member* of the A. PH. A., who is retiring from the representative staff of Fletcher & Co., Ltd., has been presented by the directors with a silver salver on the occasion of his completing forty years with the company. The staff and the representatives gave Mr. Mair a synchronous electric clock. An additional expression of good-will was a printed folio in vellum with an address and the signature of every member of the staff.

The Library of the AMERICAN PHARMACEUTICAL ASSOCIATION has received from **Dr. H. J. Goeckel,** various note-books, a number of which date back to his college days and to members of the faculty, Dr. H. H. Rusby, Prof. Virgil Coblentz and others.

Charles C. Neal, for the past thirty-six years or more a member of the staff of Sharp and Dohme has retired. Mr. Neal is now making his home in Petersburg, Va. Mr. Neal has long taken an active interest in the work of the Maryland Pharmaceutical Association, and has served as chairman of the Executive Committee for the past twenty-five years or more.

RECOMMENDATIONS OF THE CONTACT COMMITTEE TO THE U. S. P. AND N. F.

The Combined Contact Committee of the American Drug Manufacturers' Association and American Pharmaceutical Manufacturers' Association, represented by F. O. Taylor, *Chairman,* Frank B. Fisk and J. P. Snyder held an important meeting March 28th and 29th in Washington, D. C. The recommendations of its actions have been given publicity by the Committee on Publicity. The discussion dealt with many important subjects including the annual supplements and other forms of revisions. The Contact Committee "reaffirms its approval, and offers coöperative support of the principle of annual interim revisions of the United States Pharmacopœia, and further, that all changes and corrections subsequent to the First Supplement be collected into proof sheets for review and criticism, to the end that a second supplement may be made official as promptly as the annual interim revision program permits."

The Combined Contact Committee of the American Drug Manufacturers' Association and the American Pharmaceutical Manufacturers' Association direct the attention of the Committee of Revision of the National Formulary to the following request:

"In order that the purchaser of the National Formulary may be adequately, promptly and correctly informed of revisions and corrections in the text when such changes are accomplished, it is recommended that the N. F. Revision Committee provide for the proper dissemination of revisions by issuing dated supplements arranged in suitable and convenient form, permitting the registered subscriber to bring the latest Revision of the Formulary up-to-date, etc."

MASSACHUSETTS SCHOOL HOLDS AN OPEN HOUSE DAY.

Boston, Mass.—Inauguration of the first of a proposed annual series of "Open House Days" will take place April 29th, at the Massachusetts College of Pharmacy, here, under the Council. Purpose of the open house is to show to the public the progress of pharmacy in its efforts to preserve public health.

More than 5000 invitations have been sent to the public and a series of posters are being distributed to local high schools.

OBITUARY.

In *Farm Revy*, 36 (1937), 685, we note an obituary of Professor Gösta Edman who died at Stockholm, October 26, 1937, aged fifty years. Professor Edman became a Doctor of Philosophy in Pharmacy in 1930. He also studied at Vienna and Graz on a fellowship of the Swedish Pharmaceutical Society. He was made professor of botany and pharmacognosy at the Pharmaceutical Institute in Stockholm in 1933. Since 1931 he had headed the scientific control work of the Pharmacia Company and of the Apothecaries Drug Co. He was from 1935 a scientific councilor of the Royal Medical Control (Kngl. Medicinal Styrelsen) and also for the Royal Army Board. He was instrumental in the founding of the drug farm of the Pharmacia Co. He was highly rated as a teacher, and as a botanist and pharmacognosist.—(*Courtesy of C. S. Leonard.*)

OSCAR W. SMITH.

Oscar W. Smith, who died on February 7th, entered the employ of Parke, Davis & Company as a young boy and had spent fifty-two

OSCAR W. SMITH.

years in the service of the company—the past sixteen years as president.

After holding several minor clerical positions, he was sent into the field as a salesman and a few years later was put in charge of the traveling staff. When, in 1896, it was decided to open a branch in Baltimore, Mr. Smith was given the work of establishing and conducting it. Ten years later, in 1906, he was made manager of the large New York Branch of the company. During the fifteen years he occupied this important post, he was notably successful both in furthering the company's business in the east and in building up the export business carried on with the Central and South Americas.

In November 1921, he was called back to Detroit to assume the presidency of the company, and in this capacity actively directed the world-wide activities of the organization.

Mr. Smith was vice-president of the American Drug Manufacturers' Association and had for years been a leading figure in the pharmaceutical industry. He held a Colonel's Commission in the Specialists Reserve Corps of the U. S. Army. His club affiliations included the Detroit Club, the Country Club of Detroit, the Old Club, the Detroit Boat Club and The Players; also the Everglades Club, the Gulf Stream Golf Club, the Bath and Tennis Club and The Old Guard Society of Palm Beach, Florida.

The deceased was unmarried, and is survived by six cousins: Mrs. William H. MacGregor, Mrs. Alfred E. Eberts, Forrest W. Starling, Mrs. John G. Starling, Miss Nettie Beaubien, all of Detroit; and Fred P. Wohnlich of Baltimore. Mr. Smith was sixty-seven years old.

WISCONSIN CHAIRMEN NAMED.

William Kleinheinz has been named general chairman in charge of arrangements for the annual convention of the Wisconsin Pharmaceutical Association to be held May 17th, 18th and 19th at the Loraine Hotel, Madison, Wis.

Other committee chairmen include Peter H. De Bardelaben, registration; Emerson Stanley, reception; Dr. Arthur Uhl, hotel; Ivan McCranner, prizes; Wilbur Bakke, publicity; Joseph La Crosse, entertainment; Charles Charmley, advertising; Emil Hayden, sports; and A. W. Krehl, executive officers.

BOOK NOTICES.

Gould and Pyle's Pocket Cyclopedia of *Medicine and Surgery*. Third Edition, revised, illustrated, 922 pages, many tables, flexible covers, round corners, pocket size, 6¼ x 3¾ x 1", $2 50, thumb index, $3.00. Revised by R. J. E. Scott, M.A., B.C.L., M.D., New York. Published by P. Blakiston's Son & Co., Inc., 1012 Walnut Street, Philadelphia, Pa.

This work comprises a selection of brief accounts of important topics in a wide field of practical medicine and surgery. It gives a clear, intelligible description of the subject in untechnical language, and includes mostly topics of fundamental or current interest. It is of value to physicians as a brief reminder or synopsis of the subject at hand; to the nurse and student because of the clarity and practicability of points treated, and to the lay reader who will find in it many matters of great interest and vital importance to him.

Contents: Diagnosis, anatomical tables, wounds and injuries, drugs, and their general uses, poisons and antidotes, operations, tests, anesthesia, antiseptics, tables of arteries, muscles, nerves, etc. Bacteria classification illustrations of principal bacterial forms, listing of some important proprietary drugs and eponymic terms, blood test table, table of bones, physical measures of diagnosis, table of duration of pregnancy, international list of death causes, foods percentage lists, dietetic recipes, table of communicable diseases, first aid in drowning, electrical injuries, fractures, weights and measures, dose-lists, vitamins and their distribution, urinary sediments, tables of tumors, Balneo gymnastic methods, reflexes, medico-legal definitions, prescription writing, illustrations.

Qualitative Analysis by Spot Tests, by Fritz Feigl, Ph.D. Translated by Janet W. Matthews, Ph.D. Published by Nordemann Publishing Co., Inc., 215 Fourth Ave., New York City. Price, $7.00.

From the Author's Preface:

"My book *Qualitative Analyse mit Hilfe von Tüpfelreaktionen* which went into the second edition in 1935, comprises the results of seventeen years' work on specific reactions and spot tests. Owing to the extremely friendly reception which this book has received and to the continually increasing use of spot methods as a simple means of carrying out micro-analytical tests, it seemed desirable to render the contents of the book accessible to wider circles by means of an English translation."

Spot methods have become so popular during the past eight years since Professor Feigl's book was first published that there is no need to point out the rapidity, neatness and elegance of the tests which were once designated by Professor Emich as "the qualitative analysis of the future," but are now definitely of the present and are being widely incorporated, especially as identification tests, in the teaching and practice of qualitative analysis.

The tests are so simple to carry out that they are proving exceedingly useful to pharmacists, medical men, biologists and geologists who have had little training in chemistry but to whom the knowledge of the composition of their material is of vital importance.

Text Book of Pharmaceutical Arithmetic, by Theodore J. Bradley, Phm.D., A.M., B.S. Late Dean of the Faculty and Professor of Chemistry in the Massachusetts College of Pharmacy, Boston, Massachusetts. Revised by Will T. Bradley, A.M., A.B., and Carroll B. Gustafson, Ph.C., B.S., instructors in the Massachusetts College of Pharmacy, Boston, Massachusetts. Published by Lea & Febiger, Philadelphia. Price, $2.25.

It is assumed that those who use the book have a knowledge of elementary arithmetic. Since ratio and proportion are so useful in pharmaceutical and chemical arithmetic, the book begins with a consideration of these topics. The theory of arithmetic does not concern the pharmacist, and theoretical discussion is almost entirely omitted. The subject is developed by example and practice, a procedure which has proved useful alike to the student and the practicing pharmacist. The scope of this work was originally determined by the outlines of pharmaceutical arithmetic in *The Pharmaceutical Syllabus* and the *Basic Material for a Pharmaceutical Curriculum*, commonly referred to as "The Charters Report." Problems in general chemistry have been included but not those in other branches of chemistry. An adequate index enables one to turn quickly to an example covering any particular problem in arithmetic which may present itself. As a reference work this book will be found as valuable to the pharmacist as it is effective as a textbook.